

LEARNING ARITHMETIC



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TEACHER'S FOREWORD

Objective. This series—LEARNING ARITHMETIC—has as its chief objective the development of the pupil's understanding and skill in the *fundamental operations* and in *problem solving*. To attain this objective, correct teaching and learning techniques have been employed, the subject matter has been scientifically constructed and graded, and ample practice for the development of essential skills has been provided.

Organization. To enable teachers to plan their work and allot a proportionate and adequate amount of time to the various topics, the lessons have been grouped into fairly short units. Each unit covers approximately one week's work.

After every four units there is a self-test, reviewing all work covered up to that time. These self-tests show the pupil his strong and weak points and also provide the teacher with diagnostic information covering each pupil's achievements.

The placement of topics and the gradual introduction of the subject matter meet the requirements of the most recent investigations and courses of study.

Increased emphasis is given to the well-known "hard spots" in arithmetic, namely: column addition, problem solving, subtraction, long division, addition and subtraction of fractions, division of decimals, and percentage.

Constant stress is placed upon accuracy in computation rather than upon speed.

A balanced treatment has been provided for both phases of arithmetic—practice in the fundamental operations and in problem solving. The pupil attains skill in problem solving through his mastery of the comparatively few basic type-problems used in everyday life.

In solving problems pupils are directed to take these natural steps: (1) to find the facts and the question in the problem, (2) to choose the correct operation, and (3) to make the required computation. An original plan is employed, by which the pupils use the letters A, S, M, or D to record the results of their "thinking before figuring."

The problems offer an unusually rich variety of social situations common to the experiences and needs of all children. Pupil interest is maintained through frequent pages of related problems based upon familiar activities. Alert teachers and pupils will discover suggestions for many additional projects.

The exercises in the fundamental operations and in problem solving are scientifically constructed to provide adequate practice for the development and maintenance of skill in all basic number facts, the fundamental operations, and practical type-problems.

On pages 221-252, a complete review of the year's work in the fundamental operations and in problem solving is given. The material in these pages may be used for additional practice or for diagnostic purposes. Every pupil who is able to complete the work in these pages satisfactorily may be certain that he is ready for the next year's work in arithmetic.

Vocabulary. Careful attention has been given throughout the series to the use of a simple and yet adequate vocabulary. In each grade the words used have been kept well within the range of the reading vocabulary for that particular grade. The vocabulary has been checked against the various word lists now available.

Recommendations to Teachers. Carrying out the following suggestions will result in successful pupil achievement:

1. Stress accuracy rather than speed. Allow pupils to work at the speed best adapted to their own needs. See that pupils take time to do accurate work, to prove their work, to find and correct their errors, and to find the reason for any incorrect work.

2. In the initial learning stage, take time to help pupils grasp the meaning and relation of number facts, the explanations and directions, the new steps in the fundamental operations, and the new type-problem situations.

THE AUTHORS

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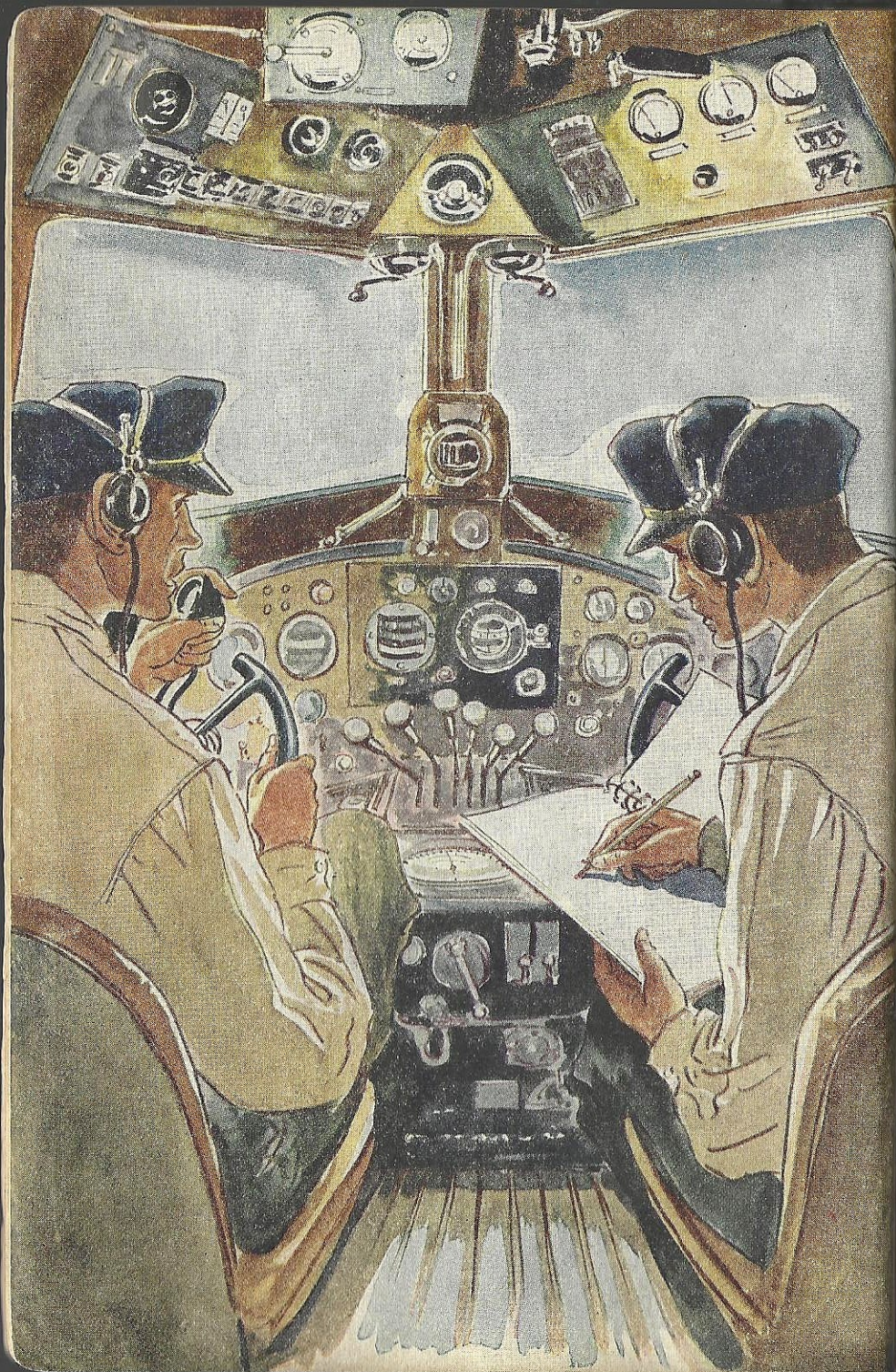
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Unit 1. Practice in Addition and Subtraction

The Value of Practice

A boy who makes the baseball team has practiced many weeks in throwing, catching, batting, and fielding the ball. Before giving a concert, a school orchestra spends many hours in rehearsal, or practice. The swimmer, the champion speller, and the expert typist—all have had to practice in order to succeed.

The aviator must not only practice flying but also must know mathematics and other subjects. Before he receives his commercial license, he must pass a difficult examination, for which he needs skill in arithmetic to solve problems quickly and accurately. He needs this skill when he uses instruments, especially while flying and landing his airplane.

Addition Practice

1. To develop skill in rapid addition, add each number in line A to each of the numbers in line B. Write the sums on folded paper.

A	4	1	7	3	6	2	9	5	8
B	2	5	1	4	7	3	8	6	9

2. Add each number in line A to each number in line B. Write the sums on folded paper.

A	5	3	7	4	9	6	8	2
B	12	34	28	86	59	47	73	65

17 37 35 90 68 53 81 67

Magic Squares

1. Find the sum of the numbers in each column and in each row of the square at the right.

4	9	2
3	5	7
8	1	6

2. What is the sum of the numbers along the diagonals of the upper square?

3. Are all the sums in the upper square the same? This is called a magic square because all these sums are the same.

4. Add the numbers in each column, row, and diagonal of the lower square. Is this a magic square?

20	27	4	11	18
26	8	10	17	19
7	9	16	23	25
13	15	22	24	6
14	21	28	5	12

Practice in Adding Columns

Add. Check by adding in the opposite direction.

1.	3	8	5	4	7	6	2	9	4
	7	4	8	6	8	5	7	5	5
	1	0	7	3	2	8	9	7	9
	9	6	1	9	9	6	3	8	0
	<u>20</u>	<u>18</u>	<u>21</u>	<u>22</u>	<u>26</u>	<u>25</u>	<u>21</u>	<u>29</u>	<u>18</u>
2.	4	7	2	2	6	5	7	9	6
	6	9	4	7	3	7	8	9	7
	7	6	7	6	1	6	4	6	5
	2	8	8	9	8	9	9	8	4
	<u>5</u>	<u>1</u>	<u>9</u>	<u>8</u>	<u>2</u>	<u>7</u>	<u>0</u>	<u>3</u>	<u>9</u>
3.	5	3	7	3	8	6	9	6	7
	7	8	9	8	7	0	8	7	9
	8	9	1	2	2	8	7	8	7
	0	6	6	6	8	6	6	1	4
	9	8	8	9	7	9	5	6	8
	<u>7</u>	<u>7</u>	<u>2</u>	<u>7</u>	<u>9</u>	<u>1</u>	<u>0</u>	<u>2</u>	<u>3</u>

Helps in Solving Problems

You will recall that there are three steps in solving problems: (1) See what facts are given in each problem and what you are asked to find. (2) Decide whether you should add, subtract, multiply, or divide, and write A, S, M, or D on your paper. (3) Work the problems.

1. By June 1 Mr. Bond had driven his car 4876 miles, and by June 30, 9243 miles. How many miles had he driven during the month?

$$\begin{array}{r} 9243 \\ - 4876 \\ \hline 4367 \end{array}$$

2. When Mr. Johnston pays \$3 for 15 gallons of gasoline, what is the price per gallon?

3. In an orchard there are 34 rows of trees, with 47 trees in each row. How many trees are there in the orchard?

4. If you average 8 pages a day, how long will it take you to read a book of 272 pages?

5. From January 1 to September 1, Harold saved \$18.74. How much more must he save to have \$25?

6. On a business trip Mr. Wilson spent \$4.86 for gas, \$.50 for oil, \$2.35 for food, and \$5.00 for hotel. How much did he spend on the trip?

Practice in Addition

1. Add downward. Check by adding upward.

931	683	687	826	967	480
827	754	916	978	395	767
698	938	827	765	765	824
769	697	287	780	978	630
784	809	980	162	619	146
909	789	691	974	957	289
<u>957</u>	<u>240</u>	<u>679</u>	<u>834</u>	<u>659</u>	<u>726</u>

Practice in Subtraction

1. Subtract each number in row B from each number in A.

A	12	16	17	18	15	13	11	14
B	3	7	4	8	2	9	5	6

2. Explain the steps in each of the examples shown at the right. Prove the remainders.

Subtract the following. Prove:

7238	5030
-2519	-2476
4719	2554

3. $\begin{array}{r} 78032 \\ 45496 \\ \hline \end{array}$ $\begin{array}{r} 35060 \\ 28416 \\ \hline \end{array}$ $\begin{array}{r} 54027 \\ 46709 \\ \hline \end{array}$ $\begin{array}{r} 48637 \\ 23008 \\ \hline \end{array}$ $\begin{array}{r} 87436 \\ 26769 \\ \hline \end{array}$
4. $\begin{array}{r} 55207 \\ 47892 \\ \hline \end{array}$ $\begin{array}{r} 61107 \\ 15428 \\ \hline \end{array}$ $\begin{array}{r} 44376 \\ 22628 \\ \hline \end{array}$ $\begin{array}{r} 58267 \\ 27929 \\ \hline \end{array}$ $\begin{array}{r} 54131 \\ 42199 \\ \hline \end{array}$
5. $\begin{array}{r} 69045 \\ 52756 \\ \hline \end{array}$ $\begin{array}{r} 82742 \\ 47053 \\ \hline \end{array}$ $\begin{array}{r} 63974 \\ 9575 \\ \hline \end{array}$ $\begin{array}{r} 93685 \\ 76008 \\ \hline \end{array}$ $\begin{array}{r} 87254 \\ 81827 \\ \hline \end{array}$
6. $\begin{array}{r} 24935 \\ 10256 \\ \hline \end{array}$ $\begin{array}{r} 53165 \\ 14459 \\ \hline \end{array}$ $\begin{array}{r} 88042 \\ 72676 \\ \hline \end{array}$ $\begin{array}{r} 42405 \\ 21808 \\ \hline \end{array}$ $\begin{array}{r} 80280 \\ 74979 \\ \hline \end{array}$
7. $\begin{array}{r} \$14.36 \\ 2.48 \\ \hline \end{array}$ $\begin{array}{r} \$7.84 \\ 2.96 \\ \hline \end{array}$ $\begin{array}{r} \$25.00 \\ 13.95 \\ \hline \end{array}$ $\begin{array}{r} \$20.00 \\ 17.65 \\ \hline \end{array}$ $\begin{array}{r} \$100.00 \\ 89.47 \\ \hline \end{array}$

Problems

- Mrs. Jones bought 3 yards of goods for \$1.50. What was the price per yard?
- In two days Mr. Smith drove 840 miles. The first day he drove 465 miles. How far did he drive the second?
- At \$1.40 an hour, what can a man earn in 42 hours?

Walter's Cash Account

Walter gets a regular allowance of 75 cents a week. He also earns money by doing various kinds of work. Below is his cash account for June:

Cash Received				Cash Paid Out			
June				June			
1	Cash on hand	\$	1.45	3	Movie	\$	1.15
1	Allowance		75	8	Roller skates		2.45
5	Errands		25	19	Ball game		75
8	Allowance		75	24	Movie		15
10	Mowing lawn		50	28	Baseball		95
15	Allowance		75	30	Total		7.45
22	Allowance		75	30	Cash on hand		
29	Allowance		75				
30	Total						

- Rule a sheet of paper and copy the cash account above. To balance the account, find the total cash received, the total cash paid out, and the cash on hand at the end of the month.

Rule sheets of paper and make out cash accounts for the following:

- May 1, class treasurer had \$13.75. May 10, took in \$21.40 from play. May 12, paid out \$3.50 for carpenter work. May 16, paid out \$2.80 for material for stage. May 21, paid out \$5.75 for play.
- July 1, cash on hand, \$7.45. July 3, bought shoes for \$4.25. July 4, bought ice-cream cone for \$.10. July 12, lost \$.15. July 22, paid \$.25 to see ball game. July 27, earned \$2.40.
- Keep your own cash account in a small book for a month. Balance your account at the end of the month.

Sight Problems

Write the answer to each problem.

1. Mr. Ward drives his car at an average speed of 45 miles per hour. How far does he drive in 5 hours?
2. At an average speed of 45 miles per hour, how long will it take Mr. Ward to drive 180 miles?
3. If boy scouts hike 12 miles in 4 hours, what is their average per hour?
4. How many square feet are there in a rug that is 9 feet wide and 12 feet long?
5. What is my change from \$1 if my purchase amounts to 57 cents?
6. A woman bought a radio for \$45 and some records for \$6. What was the total cost?
7. If a man saves \$11 a week, how long will it take him to save enough to buy a radio that costs \$110?
8. A dealer bought a radio for \$80 and sold it for \$125. What was his gain?
9. An airplane travels at a speed of 160 miles per hour. How many miles will it go in 4 hours?
10. Dan is 12 years old, and his father is 39 years old. How old was his father when Dan was born?
11. If Dan is 12 years old, in what year was he born?
12. Tom had \$2.50. He earned \$1.50 and his father gave him \$1. How much did he have then?
13. John had \$5 and lent his brother \$1.50. How much did John have left?
14. After buying 2 lb. of butter at 40¢ a pound, what is my change from \$2?

Unit 2. Practice in Multiplication

Multiplication Facts

Write the products on folded paper.

1. $\begin{array}{r} 8 \\ 7 \end{array}$ $\begin{array}{r} 6 \\ 6 \end{array}$ $\begin{array}{r} 9 \\ 8 \end{array}$ $\begin{array}{r} 7 \\ 7 \end{array}$ $\begin{array}{r} 9 \\ 3 \end{array}$ $\begin{array}{r} 7 \\ 6 \end{array}$ $\begin{array}{r} 6 \\ 4 \end{array}$ $\begin{array}{r} 9 \\ 7 \end{array}$ $\begin{array}{r} 6 \\ 9 \end{array}$
56 36
2. $\begin{array}{r} 8 \\ 3 \end{array}$ $\begin{array}{r} 7 \\ 4 \end{array}$ $\begin{array}{r} 2 \\ 8 \end{array}$ $\begin{array}{r} 6 \\ 3 \end{array}$ $\begin{array}{r} 3 \\ 8 \end{array}$ $\begin{array}{r} 9 \\ 4 \end{array}$ $\begin{array}{r} 7 \\ 9 \end{array}$ $\begin{array}{r} 4 \\ 7 \end{array}$ $\begin{array}{r} 8 \\ 9 \end{array}$
3. $\begin{array}{r} 9 \\ 6 \end{array}$ $\begin{array}{r} 7 \\ 5 \end{array}$ $\begin{array}{r} 3 \\ 6 \end{array}$ $\begin{array}{r} 9 \\ 9 \end{array}$ $\begin{array}{r} 6 \\ 7 \end{array}$ $\begin{array}{r} 4 \\ 5 \end{array}$ $\begin{array}{r} 9 \\ 5 \end{array}$ $\begin{array}{r} 7 \\ 3 \end{array}$ $\begin{array}{r} 5 \\ 6 \end{array}$
4. $\begin{array}{r} 8 \\ 6 \end{array}$ $\begin{array}{r} 6 \\ 8 \end{array}$ $\begin{array}{r} 5 \\ 5 \end{array}$ $\begin{array}{r} 3 \\ 7 \end{array}$ $\begin{array}{r} 8 \\ 8 \end{array}$ $\begin{array}{r} 5 \\ 9 \end{array}$ $\begin{array}{r} 4 \\ 9 \end{array}$ $\begin{array}{r} 5 \\ 7 \end{array}$ $\begin{array}{r} 7 \\ 8 \end{array}$
5. Add 2 to each product; then 3; then 4; then 5.
 $\begin{array}{r} 5 \\ 6 \end{array}$ $\begin{array}{r} 8 \\ 6 \end{array}$ $\begin{array}{r} 2 \\ 6 \end{array}$ $\begin{array}{r} 6 \\ 6 \end{array}$ $\begin{array}{r} 4 \\ 6 \end{array}$ $\begin{array}{r} 9 \\ 6 \end{array}$ $\begin{array}{r} 3 \\ 6 \end{array}$ $\begin{array}{r} 1 \\ 6 \end{array}$ $\begin{array}{r} 7 \\ 6 \end{array}$ $\begin{array}{r} 9 \\ 5 \end{array}$
6. Add 3 to each product; then 4; then 5; then 6.
 $\begin{array}{r} 3 \\ 7 \end{array}$ $\begin{array}{r} 6 \\ 7 \end{array}$ $\begin{array}{r} 8 \\ 7 \end{array}$ $\begin{array}{r} 4 \\ 7 \end{array}$ $\begin{array}{r} 1 \\ 7 \end{array}$ $\begin{array}{r} 5 \\ 7 \end{array}$ $\begin{array}{r} 9 \\ 7 \end{array}$ $\begin{array}{r} 2 \\ 7 \end{array}$ $\begin{array}{r} 7 \\ 7 \end{array}$ $\begin{array}{r} 7 \\ 5 \end{array}$
7. Add 3 to each product; then 4; 5; 6; 7.
 $\begin{array}{r} 2 \\ 8 \end{array}$ $\begin{array}{r} 9 \\ 8 \end{array}$ $\begin{array}{r} 5 \\ 8 \end{array}$ $\begin{array}{r} 7 \\ 8 \end{array}$ $\begin{array}{r} 4 \\ 8 \end{array}$ $\begin{array}{r} 8 \\ 8 \end{array}$ $\begin{array}{r} 3 \\ 8 \end{array}$ $\begin{array}{r} 6 \\ 8 \end{array}$ $\begin{array}{r} 1 \\ 8 \end{array}$ $\begin{array}{r} 8 \\ 5 \end{array}$
8. Add 3 to each product; then 4; 5; 6; 7; 8.
 $\begin{array}{r} 4 \\ 9 \end{array}$ $\begin{array}{r} 6 \\ 9 \end{array}$ $\begin{array}{r} 3 \\ 9 \end{array}$ $\begin{array}{r} 5 \\ 9 \end{array}$ $\begin{array}{r} 9 \\ 9 \end{array}$ $\begin{array}{r} 1 \\ 9 \end{array}$ $\begin{array}{r} 7 \\ 9 \end{array}$ $\begin{array}{r} 2 \\ 9 \end{array}$ $\begin{array}{r} 8 \\ 9 \end{array}$ $\begin{array}{r} 6 \\ 5 \end{array}$

Multiplying Larger Numbers

1. Multiply 731 by 305.

Step 1. 5×731 . Write 3655.

Step 2. 300×731 . Do not write the zeros. Write 3 (hundreds) under 6 (hundreds).

731, multiplicand
305, multiplier
3655, partial product
2193 partial product
222955, product

To check, either do the work again or interchange multiplicand and multiplier, and then multiply.

2.	$\begin{array}{r} 80 \\ 9 \end{array}$	$\begin{array}{r} 906 \\ 7 \end{array}$	$\begin{array}{r} 480 \\ 60 \end{array}$	$\begin{array}{r} 701 \\ 80 \end{array}$	$\begin{array}{r} 800 \\ 700 \end{array}$	$\begin{array}{r} 607 \\ 409 \end{array}$
3.	$\begin{array}{r} 6070 \\ 804 \end{array}$	$\begin{array}{r} 537 \\ 690 \end{array}$	$\begin{array}{r} 840 \\ 770 \end{array}$	$\begin{array}{r} 96 \\ 400 \end{array}$	$\begin{array}{r} 908 \\ 690 \end{array}$	$\begin{array}{r} 704 \\ 680 \end{array}$
4.	$\begin{array}{r} 685 \\ 742 \end{array}$	$\begin{array}{r} 793 \\ 836 \end{array}$	$\begin{array}{r} 317 \\ 427 \end{array}$	$\begin{array}{r} 635 \\ 305 \end{array}$	$\begin{array}{r} 185 \\ 468 \end{array}$	$\begin{array}{r} 214 \\ 519 \end{array}$
5.	$\begin{array}{r} 987 \\ 956 \end{array}$	$\begin{array}{r} 642 \\ 386 \end{array}$	$\begin{array}{r} 294 \\ 742 \end{array}$	$\begin{array}{r} 635 \\ 897 \end{array}$	$\begin{array}{r} 826 \\ 978 \end{array}$	$\begin{array}{r} 879 \\ 980 \end{array}$
6.	$\begin{array}{r} 1252 \\ 68 \end{array}$	$\begin{array}{r} 391 \\ 37 \end{array}$	$\begin{array}{r} 5106 \\ 178 \end{array}$	$\begin{array}{r} 553 \\ 603 \end{array}$	$\begin{array}{r} 586 \\ 418 \end{array}$	$\begin{array}{r} 491 \\ 125 \end{array}$

Problems

1. We had \$25.37 in our school treasury and spent \$12.65 for a picture. How much did we have then?

2. Our school ground is 280 feet wide and 320 feet deep. How many square feet are there in this lot?

3. There are 1465 pupils in our school. Of these, 757 are girls. How many are boys?

4. A certain store uses, on the average, 362 gallons of gasoline a month. How much does it use in a year?

Multiplying Dollars and Cents

1. Last Saturday 36 pupils went on a hike. Each pupil was charged \$1.15 for his meals and other expenses. How much did all of them pay?

Multiply exactly as if the multiplicand were 115 instead of \$1.15. Point off two places for cents.

\$1.15
36
6 90
34 5
\$41.40

2. We bought 15 suits for our football team. The suits cost \$18.75 each. How much did we pay for them?

3. The wheels of a certain automobile made 762 revolutions in going one mile. How many revolutions did they make one day when the car went 386 miles?

4. When I took a worn tire off our car, the speedometer showed it had gone 21,745 miles. How many revolutions had it made at 748 revolutions per mile?

5. A man earns \$4.50 per day. What does he earn in 28 days?

6. How much does a 5-lb. steak cost at 29¢ a pound?

Multiply:

7.	$\begin{array}{r} \$8.64 \\ 95 \\ \hline \end{array}$	$\begin{array}{r} \$80.64 \\ 38 \\ \hline \end{array}$	$\begin{array}{r} \$2.79 \\ 79 \\ \hline \end{array}$	$\begin{array}{r} \$9.38 \\ 46 \\ \hline \end{array}$	$\begin{array}{r} \$12.50 \\ 24 \\ \hline \end{array}$	
8.	$\begin{array}{r} \$69.15 \\ 46 \\ \hline \end{array}$	$\begin{array}{r} \$48.73 \\ 76 \\ \hline \end{array}$	$\begin{array}{r} \$79.25 \\ 85 \\ \hline \end{array}$	$\begin{array}{r} \$141.97 \\ 93 \\ \hline \end{array}$	$\begin{array}{r} \$29.05 \\ 15 \\ \hline \end{array}$	
9.	$\begin{array}{r} \$57.42 \\ 84 \\ \hline \end{array}$	$\begin{array}{r} \$112.25 \\ 94 \\ \hline \end{array}$	$\begin{array}{r} \$82.47 \\ 65 \\ \hline \end{array}$	$\begin{array}{r} \$18.95 \\ 37 \\ \hline \end{array}$	$\begin{array}{r} \$8.97 \\ 24 \\ \hline \end{array}$	
10.	$\begin{array}{r} 574 \\ 327 \\ \hline \end{array}$	$\begin{array}{r} 734 \\ 604 \\ \hline \end{array}$	$\begin{array}{r} 328 \\ 843 \\ \hline \end{array}$	$\begin{array}{r} 609 \\ 237 \\ \hline \end{array}$	$\begin{array}{r} 967 \\ 548 \\ \hline \end{array}$	$\begin{array}{r} 549 \\ 396 \\ \hline \end{array}$

36
18
54

16
72
48

Practice in Addition and Multiplication

Write the answers:

1. 196	572	389	479	729	961
847	346	865	347	943	840
635	985	749	839	658	257
489	697	568	685	865	874
752	438	437	658	314	536
974	879	675	736	277	609

2. 2580	369	771	185	686	1742
$\times 674$	$\times 837$	$\times 243$	$\times 989$	$\times 423$	$\times 86$

3. 4131	1640	176	752	4060	597
$\times 84$	$\times 96$	$\times 707$	$\times 843$	$\times 47$	$\times 846$

Problems

1. Material for sixth-grade costumes for a play cost \$14.25, and programs \$8.94. Find the total cost.
2. Mr. Campbell found that the total average cost per mile of driving his car has been 6¢. One year he drove 8460 miles. How much did the car cost him that year?
3. Pete has \$8.69 and his brother Bob has \$7.32. Bob has how much less than Pete? How much do both have?
4. The Harrisons pay \$50 a month rent. How much do they pay in a year?
5. At \$9.20 per head, how much should a farmer get for 45 head of sheep?
6. Tom has \$6.25 and wants to buy a suit that costs \$9.50. How much more money does he need?
7. If a man saves \$9 a month, how long will it take him to save \$162?

Two-Step Problems

For each step decide whether you should add, subtract, multiply, or divide. Write A, S, M, or D. Work the problems.

1. Mr. Jones bought 3 shirts at \$1.85 apiece and a tie for \$1.25. How much did he spend?

\$1.85
3
\$5.55
1.25
\$6.80

Step 1. Multiply \$1.85 by 3.

Step 2. Add \$5.55 and \$1.25.

2. A farmer sold three loads of wheat containing 78 bu., 87 bu., and 93 bu. at 85¢ a bushel. How much did he get for his wheat?

Step 1. $78 + 87 + 93$.

Step 2. $258 \times \$0.85$.

3. Ruth had saved \$2.35. After working 17 hours at 15¢ an hour, how much money did she have altogether?

4. Joe bought potatoes for 35¢ and a pound of butter for 30 cents. What was his change from \$1?

5. At 65¢ an hour, how much does a man earn in 24 days, working 8 hours a day?

6. Roy spent \$35.40 raising hens. He sold eggs and hens for \$51 and has hens worth \$21. What was his profit?

7. Mary bought 3 pairs of stockings at 79¢ a pair. What was her change from \$5?

8. If a man works 8 hours a day for 15 days at 75¢ an hour, how much will he earn?

9. On a trip of 465 mi., Mr. Harper bought 10 gal., 7 gal., 8 gal., and 9 gal. of gasoline. When he got home he had 2 gal. How many miles did he get to a gallon?

Problem Practice

1. Mr. Dick used 21 gallons of gasoline in driving his car 381 miles. How many miles did he average per gallon?

Explain the steps in the division. How do you reduce $\frac{3}{21}$ to $\frac{1}{7}$? How do you prove the work? Which answer is better, 18 miles and 3 over or $18\frac{1}{7}$ miles? Mr. Dick averaged $18\frac{1}{7}$ miles per gallon.

$$\begin{array}{r} 18\frac{3}{21} = 18\frac{1}{7} \\ 21 \overline{)381} \\ \underline{21} \\ 171 \\ \underline{168} \\ 3 \end{array}$$

2. A man earned \$286.22 in 22 days. How much did he earn per day?

3. Mr. Hill received \$389.50 for 19 hogs. What was the average selling price per hog?

4. Mr. Wilson had \$75. After paying \$33.50 for a suit and \$29.75 for an overcoat, how much did he have?

5. A remnant of 11 yards of cloth was bought for \$8.69. What was the cost per yard?

6. How many gallons of milk are required to fill 384 quart bottles?

7. Maud's father drove an automobile 402 miles in 12 hours. What was the average speed per hour?

8. How many square yards are there in a walk containing 1896 square feet?

9. For one year the cost of food for a certain family was \$576. Find the average cost per month.

10. The Marshall School bought 145 arithmetics at 68 cents each. How much did these cost?

11. At his road stand Arthur sold 37 bu. of potatoes at 28¢ a peck. How much did he get for the potatoes?

Division Practice

Divide. Prove by multiplying the divisor by the quotient.

1. $31 \overline{)2524}$ $42 \overline{)4839}$ $51 \overline{)4291}$ $32 \overline{)2947}$ $81 \overline{)6194}$
2. $21 \overline{)1790}$ $41 \overline{)7628}$ $52 \overline{)6738}$ $61 \overline{)5382}$ $72 \overline{)5216}$
3. $22 \overline{)8360}$ $91 \overline{)1094}$ $62 \overline{)3986}$ $82 \overline{)7916}$ $71 \overline{)4920}$
4. $92 \overline{)3507}$ $12 \overline{)8860}$ $72 \overline{)6283}$ $62 \overline{)5712}$ $52 \overline{)5306}$

5. In the following, divide each number in row A by each number in rows B and C. Prove the answers.

A	1893	8496	5064	9183	4167	3194
B	58	19	38	59	68	29
C	66	47	35	84	53	37

Problems

1. At 32 lb. per bushel, how many bushels are there in 24,595 pounds of oats?

2. If a machine stamps 82 disks a minute, how many minutes will it take to stamp 25,000 disks?

3. Harry wants to buy a bicycle that costs \$26.46. How much must he save each week for 49 weeks to pay for the bicycle?

4. Jack bought a \$32 radio for \$5 cash and the balance at \$3 a month. How many monthly payments did he have?

5. Mr. Jones took an automobile trip last week and bought 2 qt., 1 qt., and 3 qt. oil at 35¢ a quart. How much did he pay for the oil?

Formulas for Number, Price, or Cost

1. Mr. Bond bought 12 tons of coal at \$9 a ton. What was the cost of the coal?

Problem 1 gives the **number** of tons and the **price** per ton. To find the **cost** of the coal, use the formula, **number** $\times$ **price** = **cost**.

2. At \$8 a ton, how many tons of coal can I get for \$72?

Problem 2 gives the **price** and the **cost**. To find the **number**, use the formula, **cost** $\div$ **price** = **number**.

3. Mr. Ames bought 9 tons of coal for \$63. What was the price per ton?

Problem 3 gives the **number** and the **cost**. To find the **price**, use the formula, **cost** $\div$ **number** = **price**.

Write the correct formula for each problem below. Work the problems.

4. Mrs. Allen bought a small ham weighing 9 pounds for \$2.43. What was the price per pound?

5. When peaches are selling at 24¢ a can, what is the cost of 12 cans of peaches?

6. Mary bought 8 cans of corn at 12½ cents per can. How much money did she need to pay for this corn?

7. At 40¢ a pound, how many pounds of steak can you buy for \$1.50?

8. Mr. Allen paid \$2.04 for 12 gallons of gasoline. How much did he pay per gallon?

9. Find the cost of 6 shirts at 75¢ each.

10. Mrs. Ward bought a 14-pound turkey for \$4.06. What was the price per pound?

11. Write two problems that are solved by each of the formulas for finding number, price, or cost.

Three-Figure Divisors

1. Last year the total cost of operating our school was \$26,100. There were 348 pupils. What was the cost per pupil?

The division is shown at the right. The steps are exactly the same as in the case of two-figure divisors.

	\$75
348)	\$26100
	2436
	1740
	1740

2. Divide each number in row A by each number in row B. Prove the answers.

A	25042	63190	37640	88215	48290	67935
B	144	426	375	592	837	776

Problems

For each step write A, S, M, or D. Work the problems.

1. The 27 boys on our football squad weighed 2459 pounds. What was the average weight of the boys?

2. Carl earned \$3 a week for 6 weeks. How much more does he need to buy a bicycle that costs \$25?

3. A crate holds 24 quart boxes of berries. How many crates are required for 5800 quart boxes? How many boxes will be left over?

4. How many bushels and how many pounds over are there in a load of shelled corn weighing 8950 pounds? (One bushel of shelled corn weighs 56 pounds.)

5. A school board bought 166 tons of coal for one school, 120 tons for a second, and 149 tons for a third. Find the average number of tons per school.

6. Mr. Hill sold 246 sheep for \$3690. What was the selling price per sheep?

Mixed Practice

Write in columns and add:

1. 412, 79, 5027, 865, 32, 497, 530, 86
2. 275, 190, 450, 783, 47, 584, 556, 1094
3. 4217, 527, 919, 54, 5020, 787, 38, 6510
4. 579, 121, 250, 95, 3800, 470, 836, 351
5. \$1.97, \$8.65, \$15.32, \$27.85, \$0.85, \$94.00
6. \$.78, \$8.35, \$2.45, \$3.96, \$12.75, \$9.10
7. \$18.30, \$27.50, \$9.10, \$12.45, \$9.50, \$65.00

Subtract the following numbers:

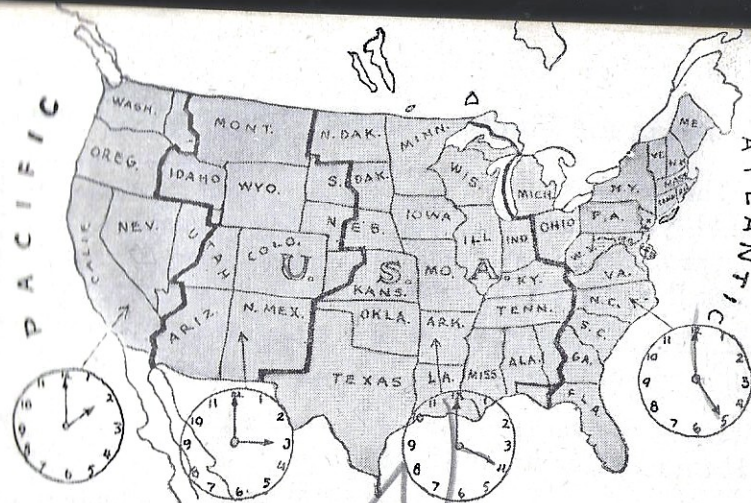
- | | | | | | |
|-----|---|---|---|---|--|
| 8. | $\begin{array}{r} 5940 \\ 3165 \\ \hline \end{array}$ | $\begin{array}{r} 3835 \\ 297 \\ \hline \end{array}$ | $\begin{array}{r} 1000 \\ 408 \\ \hline \end{array}$ | $\begin{array}{r} 6830 \\ 5376 \\ \hline \end{array}$ | $\begin{array}{r} 4901 \\ 2873 \\ \hline \end{array}$ |
| 9. | $\begin{array}{r} 5610 \\ 2875 \\ \hline \end{array}$ | $\begin{array}{r} 7539 \\ 2876 \\ \hline \end{array}$ | $\begin{array}{r} 2830 \\ 1964 \\ \hline \end{array}$ | $\begin{array}{r} 8402 \\ 2973 \\ \hline \end{array}$ | $\begin{array}{r} 6037 \\ 3865 \\ \hline \end{array}$ |
| 10. | $\begin{array}{r} \$27.00 \\ 13.25 \\ \hline \end{array}$ | $\begin{array}{r} \$8.75 \\ 2.95 \\ \hline \end{array}$ | $\begin{array}{r} \$65.00 \\ 32.50 \\ \hline \end{array}$ | $\begin{array}{r} \$15.00 \\ 12.64 \\ \hline \end{array}$ | $\begin{array}{r} \$10.00 \\ 2.85 \\ \hline \end{array}$ |

Find the products of the following pairs of numbers:

11. 28, 64 402, 367 946, 8 2134, 240 97, 46
12. 9, 4635 583, 309 860, 591 430, 465 12, 89

Divide the following numbers and prove:

- | | | | | | |
|-----|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| 13. | $82 \overline{)941}$ | $37 \overline{)809}$ | $64 \overline{)1206}$ | $53 \overline{)6047}$ | $79 \overline{)9001}$ |
| 14. | $26 \overline{)7534}$ | $64 \overline{)8943}$ | $57 \overline{)7509}$ | $68 \overline{)5346}$ | $39 \overline{)2622}$ |
| 15. | $35 \overline{)1960}$ | $46 \overline{)3318}$ | $87 \overline{)1653}$ | $44 \overline{)3659}$ | $58 \overline{)5978}$ |
| 16. | $56 \overline{)1344}$ | $19 \overline{)1769}$ | $74 \overline{)3330}$ | $62 \overline{)993}$ | $69 \overline{)5400}$ |
| 17. | $88 \overline{)2386}$ | $93 \overline{)1674}$ | $75 \overline{)2925}$ | $17 \overline{)430}$ | $96 \overline{)4068}$ |



Unit 4 Problem Solving

Time Belts

The day is determined by the rotation of the earth on its axis. Since the sun "rises" 3 hours earlier on the Atlantic coast than on the Pacific coast, there are 4 time belts in this country. The time in each belt is 1 hr. earlier than that of the belt east of it.

1. Bob Carter, in San Francisco, wishes to hear an address from Washington to be broadcast at 8 P.M. eastern time. When should he tune in?

2. An airplane leaving New York at 6 P.M. eastern time requires 4 hr. to fly to Chicago. When will it arrive in Chicago, central time?

3. At an election the polls in California closed at 7 P.M. Pacific time. If returns were broadcast two hours later, when were they heard in New York, eastern time?

4. In Washington, D. C., at 8 P.M. eastern time, George Davis is listening to a broadcast from London. There is 5 hours' difference between London and Washington. What time is it in London?

Formulas for Finding Speed, Time, and Distance

Which formula would you use for each problem below. Work the problems.

- (1) $\text{Speed} \times \text{time} = \text{distance}$
 (2) $\text{Distance} \div \text{speed} = \text{time}$
 (3) $\text{Distance} \div \text{time} = \text{speed}$

1. At an average speed of 8 miles an hour, how long will a trip of 20 miles take?
2. At an average speed of 245 miles per hour, how far will an airplane fly in 6 hours?
3. If a freight train averages 35 miles per hour, how far will it run in 14 hours?
4. An airplane flew 1078 miles in 7 hours. What was its average speed per hour?
5. Sound travels about 1100 feet in 1 second. How far will it travel in 1 minute?
6. Mr. Jones heard an explosion 5 seconds after it occurred. How far away was he? (See problem 5.)
7. At an average speed of 46 miles per hour, how long will it take an auto to make a trip of 391 miles?
8. Light travels about 930,000 miles in 5 seconds. About what is its speed per second?
9. A turtle was observed to move 20 feet in 1 minute. At this speed, how many hours and minutes will it take the turtle to go one mile?
10. The earth, rotating on its axis every 24 hours, carries a city on the equator about 25,000 miles. About how many miles per hour is this?
11. Write two problems for each of the formulas for finding speed, time, and distance.

Mixed Practice

Add the columns of numbers below:

1. \$94.30	\$7.53	\$3.57	\$5.45	\$.45
2.67	2.65	12.84	2.75	1.64
15.94	.84	1.64	1.25	2.87
<u>3.87</u>	<u>3.16</u>	<u>6.50</u>	<u>.84</u>	<u>9.30</u>

Find the difference between the numbers in each pair.

2. 8, 27 264, 197 472, 600 1520, 3910
3. \$1.84, \$3.47 \$9.84, \$10.67 \$12.45, \$17.00

Find the product of each of these pairs of numbers:

4. 39, 7 50, 21 703, 416 1500, 125 492, 510
5. 17, 212 164, 821 500, 16 76, 301 29, 1640

Problems

For each step write A for add, S for subtract, M for multiply, or D for divide. Work the problems.

1. A used automobile that cost \$865 when new was reduced \$275. What was the sale price?
2. Herbert bought a pair of shoes for \$3.50, a hat for \$2.50, and ties for \$1.50. How much did he spend?
3. At \$1.08 a bushel, what is the value of a load of wheat containing 184 bushels of wheat?
4. A farmer raised 768 bushels of wheat on a field containing 48 acres. What was the average yield per acre?
5. An airplane flew 2236 miles in 13 hours. What was the average speed in miles per hour?
6. A farmer sold 27 dozen eggs for \$6.21. How much per dozen did he average for his eggs?
7. One year Mr. Davis drove his car 17,840 miles at a cost of 5¢ per mile. Find the total cost.

Problems

1. Frank had 246 marbles. He decided to keep 50, and divided the rest equally among four of his friends. How many marbles did each of his friends receive?

$$\begin{array}{r} 246 \\ -50 \\ \hline 4 \overline{)196} \\ \underline{49} \end{array}$$

2. Euclid, the famous Greek mathematician, was born about 300 B.C. How many years ago was this?

3. It costs \$15,975 to run a certain factory for 71 days. How much on the average does it cost per day?

4. On 5 days last week it took John the following number of minutes to walk home from school: 13, 16, 17, 13, and 16. What was the average number of minutes?

$$\begin{array}{r} 13 \\ 16 \\ 17 \\ 13 \\ 16 \\ \hline 5 \overline{)75} \end{array}$$

5. Mary wants a coat that costs \$16.50. She has \$4.85, and her mother will give her \$10. How much more does she need for the coat?

6. If an airplane travels at a speed of 145 miles per hour, how far will it fly in 9 hours?

7. Arthur sold 7 hens for \$9.66. Find the average price per hen.

8. Shirts bought for \$14.50 a dozen were sold at \$1.95 apiece. What was the gain on one dozen shirts?

9. Out of the income of \$840 from a rented house, the owner paid \$100 in taxes, \$110 for insurance and repairs, and \$400 for interest. How much did he have left?

10. An 80-acre field of wheat averaged 26 bu. per acre. At 86¢ per bushel, what was the value of this wheat?

11. At 32¢ per pound, what is the cost of four turkeys weighing 12 lb., 18 lb., 15 lb., and 9 lb.?

Mixed Practice

1. Add the following columns:

4	2	3	1	4	7	7	7	8
7	3	7	5	3	9	8	3	6
3	5	5	3	5	1	9	7	6
8	6	6	9	6	5	6	5	9
9	6	8	8	7	2	4	3	6
7	8	9	6	4	9	9	1	2
3	4	1	5	2	2	4	9	4
1	9	5	2	9	5	2	8	5

2. Subtract the following:

\$19.83	\$21.20	\$5.25	\$74.94	\$15.46
<u>2.67</u>	<u>17.86</u>	<u>4.87</u>	<u>21.86</u>	<u>7.98</u>

3. Multiply the following:

\$4.94	\$1.37	\$2.42	\$12.44	\$7.95
<u>7</u>	<u>36</u>	<u>161</u>	<u>87</u>	<u>36</u>

4. Divide the following:

86)51609	243)5109	75)2784	182)9173	48)1445
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Problems

1. If you have \$5.75, earn \$3.50, and spend \$4.50, how much will you have?

2. Mrs. Ivy bought 4 pk. of plums. She used 8 qt. for canning and made the rest into 66 glasses of jelly. How many glasses of jelly did she get from one peck of plums?

3. A farmer living near a small city delivered potatoes to his customers at 30 cents a peck. How much did he get for 25 bushels of potatoes?

4. It cost \$53,125 a year to run a certain school with 625 pupils. What was the cost per pupil?

Problems

For each step write A for add, S for subtract, M for multiply, or D for divide. Work the problems.

1. During May Mrs. Scott deposited \$147.60, \$150.00, and \$31.40 in a bank and drew out \$194.35. How much did she have in the bank then?
2. On June 1 Mrs. Scott had \$134.65 in the bank. She drew out \$11.99, \$39.45, \$10.00, and \$65.80. How much did she have in the bank then?
3. In a garden 525 plants were set out in 21 equal rows. How many plants were there in each row?
4. Mrs. Scott bought a turkey weighing 13 pounds at 27¢ a pound. What was her change from \$10?
5. Tom had \$16.40 in a savings account. Then he worked 34 hours at 25¢ an hour and deposited the money to his account. How much did he have in the account then?
6. A storekeeper bought ties at \$9.50 a dozen and sold them at \$1.25 apiece. What did he make on 1 dozen ties?
7. Cloth sold regularly at \$1.25 a yard was put on sale at 98¢ a yard. How much did Mrs. Hardy save by buying 12 yards of this cloth at the sale?
8. The price of a school book was changed from 78¢ to 87¢. How much more did 145 books cost after the change in price?
9. If railroad fare is 2¢ a mile, what is the cost of 5 tickets between two cities that are 398 miles apart?
10. How much do I need to pay for 3 tennis balls that cost 35¢ apiece and a racket that costs \$6.75?
11. Harry's allowance is \$4 a month. If he saves \$1.50 a month, how much does he spend in one year?

First Self-Test

Mixed Practice Test

Time yourself to see how long it takes you to get the answers in each of the following groups:

Add:

1.	480	867	758	487	259	654
	680	397	196	952	687	768
	856	136	784	659	406	935
	409	767	967	678	958	476
	726	824	357	982	240	849
	<u>956</u>	<u>289</u>	<u>163</u>	<u>859</u>	<u>786</u>	<u>583</u>
2.	190	826	916	938	162	394
	687	687	978	698	978	865
	679	683	967	769	619	978
	871	931	395	697	974	482
	478	827	765	287	691	756
	<u>834</u>	<u>754</u>	<u>827</u>	<u>780</u>	<u>789</u>	<u>607</u>

Subtract the following:

3.	4025	2639	7893	8437	7432
	<u>2875</u>	<u>825</u>	<u>1827</u>	<u>5493</u>	<u>1544</u>

Multiply the following:

4.	457	327	859	419	406	687
	<u>604</u>	<u>286</u>	<u>617</u>	<u>208</u>	<u>723</u>	<u>498</u>
5.	592	578	936	871	214	936
	<u>782</u>	<u>396</u>	<u>507</u>	<u>352</u>	<u>803</u>	<u>549</u>

Divide the following:

6.	37)26751	56)32480	27)53794	161)57432
7.	57)36458	83)62831	78)67834	287)73809

Problem Test

For each step decide whether you should add, subtract, multiply, or divide. Find the answers.

1. At 35¢ a dozen, what is the cost of 4 doz. eggs?
2. Joan bought a reader for 90¢ and a geography for \$1.25. What was her change from \$2.50?
3. Ward paid 25¢ for 6 pencils. What was the price per pencil?
4. Mr. Banks drove his car 208 miles in 5 hours. What was his average speed per hour?
5. Tom bought 5 lb. of ham at 32¢ a pound. What was his change from \$2?
6. Mr. Andrews harvested 364 bushels of wheat from a 14-acre field. What was the average yield per acre?
7. Peggy bought 3 notebooks at 15¢ each and a pen at 49¢. How much did she spend?
8. Sam wanted to make a rabbit pen 10 ft. by 16 ft. How many feet of fencing would he need?
9. Clara bought a present for her mother for \$1.75 and one for her father for \$1.50. What was her change from a \$5 bill?
10. At 3 for 25¢, what is the cost of 9 grapefruit?
11. Tom bought a bicycle for \$15.50. After paying \$5 for repairs, he sold it for \$24. What did he gain?
12. At 11¢ a quart, what do 16 gallons of milk cost?
13. At 85¢ per bushel, what is the value of a load of wheat weighing 4200 pounds? (1 bu. wheat = 60 lb.)
14. At an average speed of 26 mi. per hour, how long will it take a freight train to run 442 miles?

Unit 5. Working with Fractions

Using Fractions with Measures

Change each of the following to inches:

1. $\frac{1}{2}$ ft. $\frac{1}{3}$ ft. $\frac{2}{3}$ ft. $\frac{1}{4}$ ft. $\frac{3}{4}$ ft. $\frac{1}{6}$ ft.
2. $\frac{5}{6}$ ft. $\frac{1}{8}$ ft. $\frac{1}{12}$ ft. $\frac{5}{12}$ ft. $\frac{7}{12}$ ft. $\frac{11}{12}$ ft.
3. $1\frac{1}{2}$ ft. $2\frac{1}{3}$ ft. $3\frac{1}{4}$ ft. $2\frac{3}{4}$ ft. $1\frac{1}{6}$ ft. $1\frac{5}{6}$ ft.
4. $\frac{1}{2}$ yd. $\frac{1}{4}$ yd. $\frac{3}{4}$ yd. $1\frac{1}{2}$ yd. $1\frac{1}{4}$ yd. $1\frac{3}{4}$ yd.
5. $\frac{1}{3}$ yd. $\frac{2}{3}$ yd. $\frac{1}{6}$ yd. $\frac{5}{6}$ yd. $\frac{1}{8}$ yd. $\frac{3}{8}$ yd.
6. $\frac{1}{9}$ yd. $\frac{4}{9}$ yd. $\frac{1}{12}$ yd. $\frac{5}{12}$ yd. $\frac{7}{12}$ yd. $\frac{11}{12}$ yd.

Change the following to ounces:

7. $\frac{1}{2}$ lb. $\frac{1}{4}$ lb. $\frac{3}{4}$ lb. $\frac{1}{3}$ lb. $\frac{2}{3}$ lb. $\frac{1}{8}$ lb.
8. $\frac{3}{8}$ lb. $\frac{5}{8}$ lb. $\frac{7}{8}$ lb. $\frac{1}{16}$ lb. $\frac{3}{16}$ lb. $\frac{5}{16}$ lb.

Change the measures below to gallons:

9. 1 qt. 2 qt. 3 qt. 1 pt. 2 pt. 4 pt.
10. 5 pt. 3 pt. 7 pt. 6 pt. 5 qt. 6 qt.

Problems

1. Grace practiced her music lesson for 45 minutes. What fraction of an hour did she practice?

$$\frac{45}{60} = \frac{3}{4}$$

Think 1 min. = $\frac{1}{60}$ hr., and 45 min. = $\frac{45}{60}$ hr. = $\frac{3}{4}$ hr.

2. Fred had 25¢ and spent 5¢ for a pencil and 10¢ for a tablet. What fraction of his money did he spend? What fraction did he have left?

3. Bob had 16 rabbits and sold 12 of them. What fractional part of the number of rabbits did he sell? What fractional part did he have left?

Simplifying Proper Fractions

1. Write the fraction for 1 part of the rectangle at the right; for all parts.

2. How does the rectangle show each of the following? $\frac{1}{16} = 1$ $\frac{8}{16} = \frac{1}{2}$ $\frac{4}{16} = \frac{1}{4}$ $\frac{2}{16} = \frac{1}{8}$

$$\frac{6}{16} = \frac{3}{8}$$

$$\frac{10}{16} = \frac{5}{8}$$

$$\frac{12}{16} = \frac{3}{4}$$

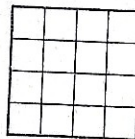
$$\frac{14}{16} = \frac{7}{8}$$

$$\frac{4}{8} = \frac{1}{2}$$

$$\frac{2}{4} = \frac{1}{2}$$

$$\frac{2}{8} = \frac{1}{4}$$

$$\frac{6}{8} = \frac{3}{4}$$

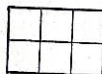


3. To change $\frac{4}{16}$ to lowest terms, divide both terms of the fraction by 4. How do you reduce $\frac{6}{8}$ to $\frac{3}{4}$?

$$\frac{4 \div 4 = 1}{16 \div 4 = 4}$$

4. Which of these fractions are in their simplest form? $\frac{1}{2}$ $\frac{6}{8}$ $\frac{5}{16}$ $\frac{2}{4}$ $\frac{12}{16}$ $\frac{7}{8}$ $\frac{2}{8}$ $\frac{13}{16}$ $\frac{5}{8}$ $\frac{2}{3}$

5. Explain how the drawing at the right shows that $\frac{2}{6} = \frac{1}{3}$, $\frac{4}{6} = \frac{2}{3}$, and $\frac{3}{6} = \frac{1}{2}$.



6. Draw a rectangle and divide it into 12 equal parts. Use your drawing to explain each of the following:

$$\frac{6}{12} = \frac{1}{2}$$

$$\frac{4}{12} = \frac{1}{3}$$

$$\frac{3}{12} = \frac{1}{4}$$

$$\frac{2}{12} = \frac{1}{6}$$

$$\frac{8}{12} = \frac{2}{3}$$

$$\frac{10}{12} = \frac{5}{6}$$

$$\frac{9}{12} = \frac{3}{4}$$

$$\frac{3}{6} = \frac{1}{2}$$

$$\frac{2}{6} = \frac{1}{3}$$

$$\frac{4}{6} = \frac{2}{3}$$

Reduce the fractions below to the simplest forms:

7. $\frac{3}{9}$ $\frac{6}{8}$ $\frac{5}{10}$ $\frac{6}{12}$ $\frac{4}{8}$ $\frac{2}{10}$ $\frac{8}{16}$ $\frac{4}{10}$

8. $\frac{4}{16}$ $\frac{3}{6}$ $\frac{6}{10}$ $\frac{8}{10}$ $\frac{4}{6}$ $\frac{2}{16}$ $\frac{4}{12}$ $\frac{6}{16}$

9. $\frac{3}{12}$ $\frac{6}{28}$ $\frac{3}{15}$ $\frac{12}{20}$ $\frac{6}{18}$ $\frac{5}{20}$ $\frac{12}{15}$ $\frac{15}{20}$

10. $\frac{16}{32}$ $\frac{4}{24}$ $\frac{10}{16}$ $\frac{2}{32}$ $\frac{3}{24}$ $\frac{5}{15}$ $\frac{2}{24}$ $\frac{8}{12}$

11. $\frac{10}{15}$ $\frac{13}{18}$ $\frac{6}{20}$ $\frac{12}{16}$ $\frac{9}{24}$ $\frac{8}{32}$ $\frac{6}{15}$ $\frac{10}{24}$

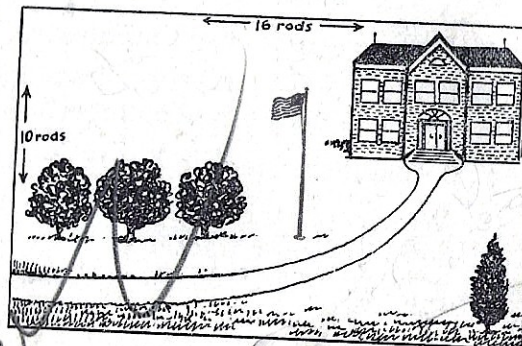
12. $\frac{18}{20}$ $\frac{8}{24}$ $\frac{14}{16}$ $\frac{16}{24}$ $\frac{10}{20}$ $\frac{12}{24}$ $\frac{24}{32}$ $\frac{9}{15}$

13. $\frac{14}{24}$ $\frac{20}{24}$ $\frac{12}{18}$ $\frac{18}{24}$ $\frac{10}{12}$ $\frac{8}{20}$ $\frac{15}{24}$ $\frac{14}{21}$

Perimeters and Areas

1. This school ground is 16 rd. by 10 rd. Find the area.

2. Draw a rectangle to represent the school ground. Let $\frac{1}{2}$ in. = 1 rd.



Draw lines to divide the rectangle into 10 rows of $\frac{1}{2}$ -inch squares, with 16 squares in each row. What does each square represent?

3. Does the area of a lot 16 rd. by 10 rd. equal more or less than 1 acre? (160 sq. rd. = 1 acre)

4. Write the formula, **length $\times$ width = area**, in your own words.

5. Find the perimeter of the school ground above. Write the formula, **$2 \times (\text{length} + \text{width}) = \text{perimeter}$** , in your own words.

6. The school building is 75 ft. long and 60 ft. wide. Find the area in square yards.

7. One of two flower beds is 8 ft. by 15 ft., and the other is 11 ft. square. Which bed is the larger?

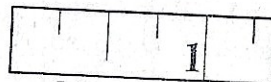
Find the numbers missing below:

Length	Width	Perimeter	Length	Width	Area
8. 9 in.	6 in.	—	14 in.	10 in.	—
9. $4\frac{1}{2}$ ft.	$3\frac{1}{2}$ ft.	—	5 yd.	—	20 sq. yd.
10. 40 rd.	25 rd.	—	—	9 ft.	99 sq. ft.
11. 24 yd.	17 yd.	—	80 rd.	45 rd.	—

Reduction of Improper Fractions to Simplest Form

1. Reduce $\frac{5}{4}$ to a mixed number.

Why is $\frac{5}{4}$ called an improper fraction? Why is $1\frac{1}{4}$ a mixed number?



$$\frac{5}{4} \text{ in.} = 1\frac{1}{4} \text{ in.}$$

2. Explain the steps in $\frac{6}{4} = 6 \div 4 = 1\frac{2}{4} = 1\frac{1}{2}$.

3. Which of the following are proper fractions? Which are improper fractions?

$\frac{3}{4}$ $\frac{9}{8}$ $\frac{11}{4}$ $\frac{2}{3}$ $\frac{6}{5}$ $\frac{10}{8}$ $\frac{7}{2}$ $\frac{5}{6}$ $\frac{12}{3}$ $\frac{20}{4}$

4. Write 3 whole numbers, 3 proper fractions, 3 improper fractions, and 3 mixed numbers.

Reduce the improper fractions below to whole or to mixed numbers. Reduce answers to lowest terms.

5. $\frac{6}{2}$ $\frac{8}{6}$ $\frac{3}{2}$ $\frac{4}{3}$ $\frac{5}{3}$ $\frac{8}{4}$ $\frac{10}{4}$ $\frac{7}{4}$
 6. $\frac{10}{3}$ $\frac{16}{3}$ $\frac{9}{4}$ $\frac{8}{7}$ $\frac{15}{7}$ $\frac{18}{8}$ $\frac{21}{8}$ $\frac{26}{8}$
 7. $\frac{25}{12}$ $\frac{22}{4}$ $\frac{13}{2}$ $\frac{23}{5}$ $\frac{25}{4}$ $\frac{27}{6}$ $\frac{34}{8}$ $\frac{27}{8}$

Addition of Like Fractions

1. Add one eighth and three eighths.

Why are $\frac{1}{8}$ and $\frac{3}{8}$ like fractions? Tell how you add like fractions.

$$\frac{\frac{1}{8}}{\frac{3}{8}} = \frac{4}{8} = \frac{1}{2}$$

2. Add: $\frac{1}{4} + \frac{1}{4}$ $\frac{1}{6} + \frac{5}{6}$ $\frac{3}{8} + \frac{7}{8}$ $\frac{2}{3} + \frac{2}{3}$

Add the following. Reduce sums to simplest forms.

3. $\frac{3}{8}$ $\frac{3}{4}$ $\frac{1}{6}$ $\frac{5}{6}$ $\frac{4}{5}$ $\frac{3}{4}$ $\frac{7}{8}$ $\frac{3}{10}$ $\frac{2}{3}$
 $\frac{3}{8}$ $\frac{3}{4}$ $\frac{1}{6}$ $\frac{5}{6}$ $\frac{3}{5}$ $\frac{1}{4}$ $\frac{5}{8}$ $\frac{7}{10}$ $\frac{2}{3}$
 4. $2\frac{1}{8}$ $4\frac{1}{6}$ $3\frac{1}{2}$ $1\frac{3}{4}$ $5\frac{5}{8}$ $1\frac{7}{10}$ $2\frac{2}{12}$
 $3\frac{1}{8}$ $2\frac{5}{6}$ $4\frac{1}{2}$ $1\frac{3}{4}$ $3\frac{3}{8}$ $2\frac{5}{10}$ $5\frac{1}{12}$
 5. $1\frac{1}{12}$ $5\frac{7}{10}$ $2\frac{1}{8}$ $4\frac{3}{5}$ $1\frac{11}{12}$ $3\frac{2}{3}$ $6\frac{3}{16}$
 $3\frac{7}{12}$ $2\frac{9}{10}$ $4\frac{3}{8}$ $2\frac{4}{5}$ $3\frac{7}{12}$ $4\frac{2}{3}$ $2\frac{5}{16}$

Three Formulas for Area

1. Give each of the three formulas at the right in your own words.

- (1) Length $\times$ width = area
- (2) Area $\div$ length = width
- (3) Area $\div$ width = length

2. How many square inches are there in a pane of glass 12 in. by 9 in.?

3. Fred wants a garden plot of 96 square feet. If he makes his plot 8 ft. wide, what is its length?

4. A rug containing 24 sq. yd. is 6 yd. long. What is the width of this rug?

5. Ruth measured a piece of linoleum. The length was 9 ft., and the width $8\frac{1}{2}$ ft. What was the area?

6. Draw a square to represent the number of square feet in 1 square yard. Explain why 1 sq. yd. = 9 sq. ft.

7. What fraction of a square yard is 3 sq. ft.? 6 sq. ft.? 1 sq. ft.? 4 sq. ft.? 7 sq. ft.?

8. Draw a square to show that 1 square foot equals 144 square inches.

9. What fraction of a square foot is 36 sq. in.? 72 sq. in.? 108 sq. in.? 48 sq. in.? 96 sq. in.?

10. At \$5.98 per square yard, what is the cost of a rug 15 ft. wide and 24 ft. long?

11. How many square rods are there in a field 120 rods by 96 rods? How many acres are there in this field?

12. How many rods of fencing will be needed for a pasture 75 rods long and 48 rods wide?

13. A sidewalk is 31 yards 2 feet long. What is its length in feet?

14. Write one problem for each of the three formulas for area. Solve your problems.

Changing Fractions to Higher Terms

1. Change $\frac{2}{3}$ to sixths.

Show that $\frac{1}{3} = \frac{2}{6}$, and that $\frac{2}{3} = \frac{4}{6}$. By what number do you multiply both terms of $\frac{2}{3}$ to get $\frac{4}{6}$?



Change the following fractions to higher terms. Find the missing numerators.

2. $\frac{1}{2} = \frac{\quad}{4}$ $\frac{1}{3} = \frac{\quad}{9}$ $\frac{1}{3} = \frac{\quad}{6}$ $\frac{2}{3} = \frac{\quad}{6}$ $\frac{4}{5} = \frac{\quad}{15}$
3. $\frac{1}{4} = \frac{\quad}{8}$ $\frac{1}{3} = \frac{\quad}{12}$ $\frac{1}{4} = \frac{\quad}{12}$ $\frac{3}{4} = \frac{\quad}{12}$ $\frac{2}{3} = \frac{\quad}{12}$
4. $\frac{1}{6} = \frac{\quad}{12}$ $\frac{1}{6} = \frac{\quad}{18}$ $\frac{5}{6} = \frac{\quad}{12}$ $\frac{3}{5} = \frac{\quad}{15}$ $\frac{2}{3} = \frac{\quad}{18}$
5. $\frac{1}{9} = \frac{\quad}{18}$ $\frac{1}{3} = \frac{\quad}{18}$ $\frac{2}{3} = \frac{\quad}{15}$ $\frac{1}{4} = \frac{\quad}{16}$ $\frac{2}{5} = \frac{\quad}{15}$
6. $\frac{3}{8} = \frac{\quad}{16}$ $\frac{5}{8} = \frac{\quad}{16}$ $\frac{7}{8} = \frac{\quad}{16}$ $\frac{2}{9} = \frac{\quad}{18}$ $\frac{5}{9} = \frac{\quad}{18}$

Addition of Unlike Fractions



1. Mary used $1\frac{1}{4}$ cups of sugar in a lemon cream pie and $1\frac{1}{2}$ cups of sugar in a fruit cake. How many cups of sugar did she use?

What is the first step in adding unlike fractions? What is the least common denominator of fourths and halves?

Explain $\frac{1}{4} + \frac{1}{2} = \frac{1}{4} + \frac{2}{4} = \frac{3}{4}$. How do you change $\frac{1}{2}$ to $\frac{2}{4}$? How do you add unlike fractions?

Add the following. Reduce sums to simplest forms.

2. $\frac{1}{2} + \frac{1}{8} = \frac{\quad}{\quad}$ $\frac{1}{2} + \frac{3}{8} = \frac{\quad}{\quad}$ $\frac{5}{8} + \frac{1}{2} = \frac{\quad}{\quad}$ $\frac{1}{2} + \frac{1}{8} = \frac{\quad}{\quad}$ $\frac{3}{8} + \frac{1}{4} = \frac{\quad}{\quad}$ $\frac{3}{4} + \frac{1}{8} = \frac{\quad}{\quad}$
3. $\frac{2\frac{3}{4}}{\frac{3}{8}} + \frac{1\frac{5}{8}}{\frac{2}{4}} = \frac{\quad}{\quad}$ $\frac{2\frac{1}{6}}{\frac{3}{2}} + \frac{4\frac{1}{3}}{\frac{5}{6}} = \frac{\quad}{\quad}$ $\frac{2\frac{1}{6}}{\frac{3}{2}} + \frac{4\frac{5}{6}}{\frac{2}{2}} = \frac{\quad}{\quad}$ $\frac{3\frac{2}{3}}{\frac{5}{6}} + \frac{3\frac{1}{2}}{\frac{1}{4}} = \frac{\quad}{\quad}$

Unit 6. Addition of Fractions

Sight Work in Finding the L. C. D.

You cannot add unlike fractions until you reduce them to a common denominator. Name at sight the least common denominator (l.c.d.) for each pair of fractions. Then add:

1. $\frac{1}{2} + \frac{3}{4}$ $\frac{5}{8} + \frac{1}{2}$ $\frac{3}{4} + \frac{7}{8}$ $\frac{1}{2} + \frac{7}{16}$ $\frac{3}{4} + \frac{3}{16}$ $\frac{5}{8} + \frac{1}{16}$
2. $\frac{1}{2} + \frac{5}{6}$ $\frac{2}{3} + \frac{1}{6}$ $\frac{1}{3} + \frac{1}{2}$ $\frac{1}{3} + \frac{2}{9}$ $\frac{1}{3} + \frac{5}{12}$ $\frac{1}{4} + \frac{3}{12}$
3. $\frac{5}{6} + \frac{1}{12}$ $\frac{1}{2} + \frac{1}{12}$ $\frac{2}{3} + \frac{3}{4}$ $\frac{1}{4} + \frac{4}{5}$ $\frac{1}{6} + \frac{3}{4}$ $\frac{1}{2} + \frac{7}{10}$
4. $\frac{1}{5} + \frac{7}{10}$ $\frac{1}{2} + \frac{4}{5}$ $\frac{1}{3} + \frac{2}{5}$ $\frac{2}{3} + \frac{4}{15}$ $\frac{4}{5} + \frac{7}{15}$ $\frac{1}{2} + \frac{1}{18}$
5. $\frac{2}{3} + \frac{7}{18}$ $\frac{5}{6} + \frac{5}{18}$ $\frac{4}{9} + \frac{1}{18}$ $\frac{1}{2} + \frac{5}{9}$ $\frac{5}{6} + \frac{4}{9}$ $\frac{2}{3} + \frac{7}{9}$
6. $\frac{2}{3} + \frac{5}{24}$ $\frac{5}{6} + \frac{7}{24}$ $\frac{3}{8} + \frac{1}{24}$ $\frac{1}{3} + \frac{5}{8}$ $\frac{5}{6} + \frac{3}{8}$ $\frac{1}{8} + \frac{5}{12}$

In all your work with fractions, each answer must be reduced to the simplest form. Reduce each number below to its simplest form. Examples: $6\frac{8}{8} = 8\frac{2}{2}$ $4\frac{12}{8} = 5\frac{1}{2}$

7. $6\frac{8}{8}$ $4\frac{12}{8}$ $\frac{8}{4}$ $4\frac{6}{6}$ $2\frac{3}{2}$ $5\frac{8}{2}$ $9\frac{6}{3}$
8. $3\frac{15}{12}$ $4\frac{10}{3}$ $6\frac{9}{8}$ $3\frac{10}{5}$ $5\frac{7}{5}$ $2\frac{12}{4}$ $3\frac{20}{16}$
9. $5\frac{11}{5}$ $2\frac{6}{10}$ $3\frac{10}{8}$ $4\frac{24}{20}$ $6\frac{8}{8}$ $7\frac{15}{12}$ $3\frac{12}{9}$

Addition of Fractions

1. $\frac{3\frac{1}{3}}{\frac{4}{4}} + \frac{4\frac{2}{3}}{\frac{6}{2}} = \frac{\quad}{\quad}$ $\frac{2\frac{5}{12}}{\frac{3}{2}} + \frac{7\frac{3}{8}}{\frac{5}{12}} = \frac{\quad}{\quad}$ $\frac{1\frac{3}{4}}{\frac{4}{4}} + \frac{4\frac{1}{2}}{\frac{5}{12}} = \frac{\quad}{\quad}$ $\frac{5\frac{5}{12}}{\frac{4}{4}} + \frac{5\frac{7}{12}}{\frac{2}{2}} = \frac{\quad}{\quad}$
2. $\frac{5\frac{3}{4}}{\frac{6}{6}} + \frac{3\frac{3}{4}}{\frac{2}{8}} = \frac{\quad}{\quad}$ $\frac{1\frac{3}{5}}{\frac{4}{2}} + \frac{6\frac{1}{8}}{\frac{2}{6}} = \frac{\quad}{\quad}$ $\frac{4\frac{3}{8}}{\frac{2}{6}} + \frac{2\frac{5}{12}}{\frac{3}{8}} = \frac{\quad}{\quad}$ $\frac{9\frac{3}{8}}{\frac{5}{16}} + \frac{5\frac{7}{16}}{\frac{1}{16}} = \frac{\quad}{\quad}$
3. $\frac{9\frac{5}{8}}{\frac{7}{6}} + \frac{8\frac{4}{5}}{\frac{3}{3}} = \frac{\quad}{\quad}$ $\frac{7\frac{5}{12}}{\frac{9}{8}} + \frac{5\frac{5}{8}}{\frac{8}{3}} = \frac{\quad}{\quad}$ $\frac{4\frac{7}{16}}{\frac{6}{8}} + \frac{6\frac{4}{5}}{\frac{5}{4}} = \frac{\quad}{\quad}$ $\frac{8\frac{2}{3}}{\frac{5}{4}} + \frac{9\frac{14}{15}}{\frac{1}{15}} = \frac{\quad}{\quad}$



Add, Subtract, Multiply, or Divide?

For each step write A, S, M, or D. Work the problems.

1. One week Peter sold papers from his stand for \$37.45. He paid \$29.80 for the papers and gave George \$3.50 for helping. How much did Peter get for his work?

2. The next week Peter and George shared the gains equally. They paid \$33.60 for papers and sold them for \$42.80. Find each boy's share of the gain.

3. A train covered a distance of 380 miles in 8 hours. What was its average speed?

4. At 18¢ per square foot, what is the cost of laying a new floor in a room 15 ft. wide and 18 ft. long?

5. At \$4.75 per square yard, what is the cost of a rug 15 ft. by 12 ft.?

6. Charles sold 2 pecks of cherries at 12¢ a quart. How much did he receive for the cherries?

7. How much money do I need to buy 3 tennis balls at 35¢ each and a tennis racket for \$3.85?

8. The area of a floor is 300 square feet, and its length is 24 feet. What is the width of the floor?

9. In 4 days Mr. Jones drove 517 mi., 642 mi., 598 mi., and 639 mi. Find his daily average.

10. At an average speed of 175 miles per hour, how long will it take an airplane to fly 1100 miles?

11. At \$8 each, how many sheep can you get for \$280?

Using Fractions in Measure

Change months to years. Ex.: 18 mo. = $1\frac{1}{2}$ yr.

1. 12 mo. 1 mo. 2 mo. 3 mo. 4 mo. 5 mo.

2. 6 mo. 7 mo. 8 mo. 9 mo. 10 mo. 11 mo.

3. 24 mo. 30 mo. 15 mo. 16 mo. 20 mo. 21 mo.

Change days to months. Ex.: 2 da. = $\frac{2}{30}$ mo. = $\frac{1}{15}$ mo.

4. 30 da. 15 da. 1 da. 10 da. 5 da. 6 da.

5. 3 da. 18 da. 20 da. 12 da. 24 da. 27 da.

6. 60 da. 90 da. 45 da. 36 da. 40 da. 70 da.

Change inches to feet. Ex.: 17 in. = $1\frac{5}{12}$ ft.

7. 12 in. 6 in. 4 in. 3 in. 2 in. 1 in.

8. 5 in. 8 in. 9 in. 7 in. 11 in. 10 in.

9. 18 in. 16 in. 15 in. 20 in. 21 in. 27 in.

Change ounces to pounds. Ex.: 28 oz. = $1\frac{4}{8}$ lb. = $1\frac{1}{2}$ lb.

10. 16 oz. 8 oz. 4 oz. 2 oz. 1 oz. 3 oz.

11. 6 oz. 10 oz. 14 oz. 7 oz. 9 oz. 5 oz.

12. 13 oz. 15 oz. 11 oz. 20 oz. 24 oz. 22 oz.

13. 26 oz. 30 oz. 40 oz. 36 oz. 44 oz. 50 oz.

Practice in Long Division

Give remainders as fractions in their lowest terms.

1. $34\overline{)2876}$ $46\overline{)7840}$ $653\overline{)9168}$ $62\overline{)7956}$ $959\overline{)6043}$

2. $57\overline{)7600}$ $58\overline{)4280}$ $737\overline{)3842}$ $78\overline{)7503}$ $864\overline{)2568}$

3. $48\overline{)1682}$ $64\overline{)7287}$ $294\overline{)9086}$ $88\overline{)6918}$ $245\overline{)4835}$

4. $56\overline{)2697}$ $85\overline{)8765}$ $144\overline{)5078}$ $55\overline{)1629}$ $796\overline{)4768}$

5. $65\overline{)9726}$ $74\overline{)8979}$ $350\overline{)8097}$ $67\overline{)6398}$ $814\overline{)8190}$



Horizontal Multiplication

Clarence works in a grocery on Saturdays. In helping his employer make out bills, Clarence finds it convenient to multiply

horizontally when using one-figure multipliers.

1. Eight cases of tomato juice, 24 cans per case, were ordered in September. How many cans were ordered?

Multiply 24 by 8 without writing 8 below 24.

$$8 \times 24 = 192$$

2. At \$2.15 per case, what do 6 cases of peas cost? Multiply \$2.15 by 6 horizontally. Point off for cents.

Multiply the following without copying the numbers:

3. 9×76 8×49 7×93 6×837 5×964

4. 8×197 6×486 7×294 5×1365 3×879

5. 7×406 8×287 9×676 5×840 6×893

6. 8×196 7×879 5×567 4×493 9×582

7. 9×769 8×438 7×847 4×926 6×972

8. 7×187 9×650 5×807 8×340 7×493

9. $4 \times \$1.85$ $7 \times \$5.64$ $3 \times \$3.45$ $9 \times \$9.85$

10. $5 \times \$16.50$ $6 \times \$2.65$ $2 \times \$4.15$ $8 \times \$7.18$

11. Multiply each number in row A by each number in row B. Find the products without copying the numbers.

A	58	675	849	\$26.45	\$38.98
B	7	5	9	6	8

Addition of Three Fractions

1. In making tarts, Mrs. Morlock used $\frac{2}{3}$ cup butter, $2\frac{1}{4}$ cups sugar, and $3\frac{3}{8}$ cups flour. How many cups was this?

Study the example at the right until you understand each step.

How do you find the l.c.d. of thirds, fourths, and eighths?

$\frac{2}{3}$	16
$2\frac{1}{4}$	6
$3\frac{3}{8}$	9
$6\frac{7}{24}$	$\frac{31}{24} = 1\frac{7}{24}$

How do you change the fractions to twenty-fourths? How do you change $3\frac{1}{4}$ to $1\frac{7}{24}$?

2. Mr. James worked $7\frac{1}{2}$ hr. on Monday, $6\frac{3}{4}$ hr. on Tuesday, and $7\frac{1}{3}$ hr. on Wednesday. How many hours did he work in the three days?

3. Mrs. James bought three remnants of cloth measuring $4\frac{1}{3}$ yd., $2\frac{1}{2}$ yd., and $6\frac{5}{8}$ yd. How many yards of cloth did she buy?

4. In a certain book the inner margin of the page is $\frac{3}{4}$ in., the printed part is $3\frac{5}{8}$ in. wide, and the outer margin is $\frac{1}{4}$ in. Find the width of the entire page.

Add the following. Reduce answers to lowest terms.

5. $\frac{1}{3} + \frac{1}{2} + \frac{1}{8} = \frac{1}{6} + \frac{1}{2} = \frac{1}{6} + \frac{3}{6} = \frac{4}{6} = \frac{2}{3}$

6. $1\frac{1}{2} + 4\frac{1}{4} + 3\frac{5}{12} = 2\frac{3}{6} + 4\frac{1}{4} + 3\frac{5}{12} = 2\frac{3}{6} + 4\frac{1}{4} + 3\frac{5}{12} = 7\frac{2}{3} + 4\frac{1}{4} + 3\frac{5}{12} = 14\frac{11}{12}$

7. $2\frac{2}{3} + 3\frac{3}{4} + 4\frac{5}{6} = 2\frac{4}{6} + 3\frac{9}{12} + 4\frac{5}{6} = 2\frac{4}{6} + 3\frac{9}{12} + 4\frac{5}{6} = 10\frac{11}{12}$

Making Out Bills

1. Copy the following bill. Figure the costs by multiplying horizontally.

4 yd. silk crepe @ \$1.65	\$6.60
9 yd. gingham @ 41¢	41
3 spools cotton thread @ 6¢	6
2 spools silk thread @ 18¢	18
5 yd. ribbon @ 17¢	17
6 doz. buttons @ 45¢	45
5 yd. wool crepe @ \$1.35	1.35
7 yd. lace @ 24¢	24
Total	9.46

Make out bills for the following. Multiply horizontally.

2. 3 lb. coffee @ 39¢; 2 bunches celery @ 15¢; 1 sack flour @ \$2.40; 2 lb. nuts @ 60¢; 3 boxes crackers @ 15¢; 2 qt. berries @ 12¢; 8 lb. sugar @ 6¢; 9 lb. beans @ 10¢.

3. 4 chairs @ \$8.75; 2 small rugs @ \$14.35; 6 pairs of curtains @ \$9.40; 1 table @ \$18.50; 3 blankets @ \$5.95; 2 candlesticks @ \$2.65; 8 yd. cretonne @ 75¢.

4. 6 pencils @ 3¢; 5 erasers @ 2¢; 4 pads of paper @ 8¢; 3 pens @ 1¢; 7 rulers @ 4¢; 8 bottles of ink @ 5¢; 2 penholders @ 3¢; 9 boxes of crayons @ 6¢.

Answer the following without copying the numbers:

- | | | | |
|----------------------|-------------------|-------------------|-------------------|
| 5. $8 \times \$2.46$ | $9 \times \$3.54$ | $4 \times \$2.81$ | $7 \times \$8.90$ |
| 6. $5 \times \$3.61$ | $3 \times \$4.05$ | $2 \times \$7.93$ | $6 \times \$5.82$ |
| 7. $7 \times \$3.14$ | $9 \times \$7.81$ | $8 \times \$3.05$ | $3 \times \$2.79$ |
| 8. $2 \times \$2.46$ | $5 \times \$5.09$ | $6 \times \$1.76$ | $4 \times \$6.97$ |

Unit 7. Addition of Fractions

Practice in Adding Mixed Numbers

- | | | | | | | |
|----------------|----------------|-----------------|----------------|-----------------|----------------|-----------------|
| $6\frac{3}{4}$ | $2\frac{2}{3}$ | $12\frac{3}{4}$ | $3\frac{5}{6}$ | $4\frac{3}{4}$ | $1\frac{3}{4}$ | $6\frac{3}{5}$ |
| $2\frac{1}{2}$ | $8\frac{3}{4}$ | $7\frac{2}{3}$ | $6\frac{3}{4}$ | $6\frac{7}{8}$ | $5\frac{3}{8}$ | $4\frac{9}{10}$ |
| $3\frac{3}{8}$ | $6\frac{1}{6}$ | $9\frac{1}{2}$ | $5\frac{2}{3}$ | $8\frac{5}{16}$ | $6\frac{5}{6}$ | $2\frac{1}{2}$ |
- | | | | | | | |
|----------------|----------------|----------------|----------------|-----------------|-----------------|-----------------|
| $2\frac{2}{3}$ | $2\frac{5}{8}$ | $6\frac{1}{2}$ | $4\frac{1}{3}$ | $7\frac{7}{16}$ | $8\frac{1}{6}$ | $1\frac{2}{3}$ |
| $6\frac{1}{3}$ | $3\frac{3}{4}$ | $4\frac{2}{3}$ | $5\frac{1}{2}$ | $5\frac{5}{8}$ | $7\frac{5}{8}$ | $4\frac{3}{4}$ |
| $4\frac{1}{2}$ | $6\frac{1}{2}$ | $7\frac{1}{4}$ | $8\frac{1}{3}$ | $9\frac{3}{4}$ | $6\frac{5}{12}$ | $5\frac{7}{12}$ |
- | | | | | | | |
|-----------------|-----------------|-----------------|----------------|-----------------|----------------|-----------------|
| $8\frac{5}{8}$ | $7\frac{5}{6}$ | $2\frac{1}{2}$ | $4\frac{3}{8}$ | $9\frac{3}{4}$ | $5\frac{5}{8}$ | $2\frac{1}{5}$ |
| $\frac{3}{4}$ | $4\frac{5}{12}$ | $6\frac{5}{8}$ | $7\frac{2}{3}$ | $5\frac{5}{8}$ | $7\frac{1}{6}$ | $3\frac{1}{4}$ |
| $7\frac{5}{16}$ | $8\frac{1}{2}$ | $3\frac{5}{16}$ | $2\frac{3}{4}$ | $9\frac{7}{16}$ | $6\frac{2}{3}$ | $7\frac{3}{10}$ |

Problems

1. In a certain book the upper margin of the page was $\frac{1}{2}$ in., the printed part was $6\frac{1}{2}$ in. long, and the lower margin was $\frac{7}{8}$ in. How long was the page?

2. Our baseball team practiced $2\frac{1}{2}$ hr. on Monday, $1\frac{1}{4}$ hr. on Wednesday, and $2\frac{3}{4}$ hr. on Saturday. How many hours did we practice in the three days?

3. What is the total weight of 3 parcel-post packages weighing $2\frac{1}{4}$ lb., $3\frac{3}{8}$ lb., and $1\frac{7}{16}$ lb.?

4. One day Ruth mailed packages weighing $\frac{9}{16}$ lb., $2\frac{7}{8}$ lb., and $3\frac{3}{4}$ lb. Find their total weight.

5. A carpenter had a plank $2\frac{1}{4}$ in. thick. To make a beam, he nailed a $\frac{7}{8}$ inch board on each side of the plank. How thick was the beam?

Sight Problems

1. The top of a desk is 4 ft. wide and $6\frac{1}{2}$ ft. long. What is the perimeter of this desk top?
2. Frank mailed 2 packages weighing $1\frac{1}{4}$ lb. and $2\frac{3}{4}$ lb. What was the combined weight of the packages?
3. In one month of 30 days, 24 days were fair. What fraction of the days were fair?
4. If a piece of board is 4 inches wide, how long must it be to contain 144 square inches?
5. A piece of cardboard containing 1 square foot is 6 inches wide. How long is it?
6. At an average speed of 3 miles per hour, how long will it take a man to walk 16 miles?
7. How fast must a man drive to go 164 miles in 4 hr.?
8. Mrs. Conrad bought 5 dozen eggs for \$1.75. What was the price per dozen?
9. At 4 cents each, how many grapefruit can we buy for 60 cents?
10. Ed worked 12 hr. at 30¢ an hour. What did he earn?
11. At 35 cents per hour, how many hours would Walter have to work to earn \$7?
12. One week Walter earned \$3 by working 15 hours. How much did he earn per hour?
13. A freight train ran 140 miles in 4 hours. What was the average speed per hour?
14. Joe paid 60 cents for a cap. What fraction of a dollar did he spend?
15. Betty goes to school 9 months a year. What fractional part of the year is her vacation?

Practice in Addition of Fractions

Practice until you can find the sums quickly:

- | | | | | |
|---|--|---|-------------------------------|-------------------------------|
| 1. $\frac{1}{2} + \frac{1}{3}$ | $\frac{2}{3} + \frac{1}{4}$ | $\frac{1}{8} + \frac{1}{4}$ | $\frac{1}{6} + \frac{1}{2}$ | $\frac{1}{3} + \frac{1}{4}$ |
| 2. $\frac{1}{3} + \frac{1}{6}$ | $\frac{1}{4} + \frac{1}{6}$ | $\frac{1}{2} + \frac{1}{5}$ | $\frac{1}{2} + \frac{1}{10}$ | $\frac{1}{5} + \frac{1}{10}$ |
| 3. $\frac{1}{3} + \frac{1}{9}$ | $\frac{1}{3} + \frac{1}{5}$ | $\frac{1}{4} + \frac{1}{5}$ | $\frac{1}{3} + \frac{1}{8}$ | $\frac{1}{6} + \frac{1}{8}$ |
| 4. $\frac{1}{2} + \frac{1}{12}$ | $\frac{1}{3} + \frac{1}{12}$ | $\frac{1}{4} + \frac{1}{12}$ | $\frac{1}{6} + \frac{1}{12}$ | $\frac{1}{8} + \frac{1}{12}$ |
| 5. $\frac{1}{6} + \frac{1}{9}$ | $\frac{1}{2} + \frac{1}{9}$ | $\frac{1}{4} + \frac{1}{10}$ | $\frac{1}{10} + \frac{1}{20}$ | $\frac{1}{12} + \frac{1}{24}$ |
| 6. $\frac{1}{8} + \frac{1}{16}$ | $\frac{1}{4} + \frac{1}{16}$ | $\frac{1}{2} + \frac{1}{16}$ | $\frac{1}{3} + \frac{1}{15}$ | $\frac{1}{5} + \frac{1}{15}$ |
| 7. $\frac{1}{2} + \frac{3}{4} + 1\frac{1}{8}$ | $2\frac{1}{3} + 1\frac{1}{2} + 3\frac{1}{4}$ | $3 + 6\frac{1}{2} + 2\frac{2}{3}$ | | |
| 8. $4 + 2\frac{1}{4} + 3\frac{3}{8}$ | $2\frac{1}{2} + 3\frac{3}{8} + 3\frac{3}{4}$ | $4\frac{1}{4} + 2\frac{3}{8} + 5$ | | |
| 9. $6\frac{1}{3} + 4\frac{1}{6} + 1\frac{1}{5}$ | $2\frac{1}{2} + 8\frac{3}{8} + 1\frac{1}{4}$ | $1\frac{1}{4} + 2\frac{2}{8} + 3\frac{1}{16}$ | | |
| 10. $5\frac{3}{4} + \frac{3}{8} + \frac{3}{16}$ | $1\frac{1}{2} + 2\frac{2}{3} + 4\frac{1}{2}$ | $1\frac{1}{2} + 1\frac{1}{6} + 2\frac{1}{3}$ | | |
| 11. $2\frac{3}{4} + 1\frac{1}{3} + 2\frac{1}{2}$ | $\frac{1}{6} + 2\frac{2}{3} + 3\frac{1}{9}$ | $6\frac{1}{3} + 5\frac{1}{6} + 1\frac{1}{9}$ | | |
| 12. $2\frac{1}{8} + 2\frac{1}{4} + 2\frac{1}{16}$ | $\frac{5}{8} + 3\frac{3}{4} + \frac{1}{16}$ | $4\frac{3}{4} + 6\frac{3}{8} + 2\frac{5}{8}$ | | |

Problems

1. Joan lives $1\frac{1}{4}$ miles from school. How far does she walk in going to school and home again?
2. What is the combined weight of two hens weighing $3\frac{1}{2}$ pounds and $4\frac{3}{4}$ pounds?
3. Our team has won 12 games and lost 8. What fraction of the games played has the team won? What fraction of the games played has the team lost?
4. Mr. James worked $7\frac{1}{2}$ hr. on Monday, $6\frac{2}{3}$ hr. on Tuesday, and $7\frac{3}{4}$ hr. on Wednesday. How many hours did he work in the 3 days?
5. In one month of 30 days, we had 21 days of school. What fraction of the month did we have school?

Area and Volume

1. What is the area in square yards of a floor 36 ft. long and 15 ft. wide?

The formula for finding area is
 $\text{area} = \text{length} \times \text{width}$, or $A = lw$.
 Think $36 \times 15 \div 9$.

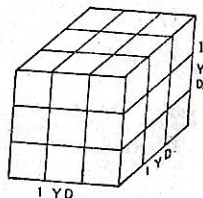
$$\frac{36 \times 15}{9} = 60$$

2. Find the number of square yards in a garage floor 21 ft. wide and 30 ft. long.
3. How many acres are in a field 80 rd. by 180 rd.?

1728 cubic inches = 1 cubic foot
 27 cubic feet = 1 cubic yard
 128 cubic feet = 1 cord

4. How many cubic feet are there in 1 cubic yard?

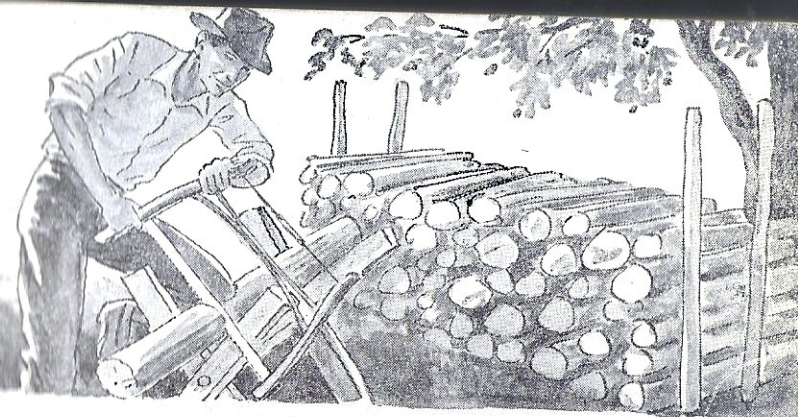
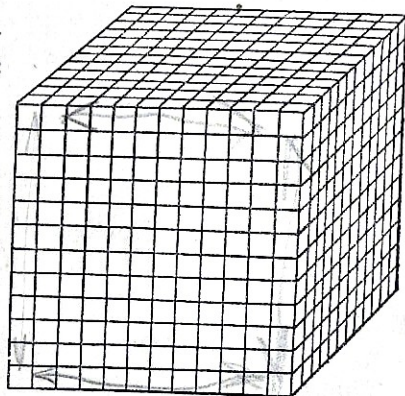
The drawing represents 1 cubic yard.
 There are 3 layers of 1-foot cubes with
 3 rows of 3 cubes in each layer.
 $3 \times 3 \times 3 = 27$ cu. ft.



The formula for finding volume is:
 $\text{volume} = \text{length} \times \text{width} \times \text{height}$, or $V = lwh$.

5. How many cubic inches are there in 1 cubic foot?

The drawing represents
 1 cubic foot. There are 12
 layers of 1-in. cubes with
 12 rows of 12 cubes in each
 layer. How many cubes
 are there in each layer?
 $12 \times 12 \times 12 = 1728$ cu. in.



Measuring Volume, Area, and Perimeter

1. A cord of firewood is a pile 8 ft. long, 4 ft. wide, and 4 ft. high. How many cubic feet is this?
2. How many cords of wood are there in a pile of wood 48 ft. long, 4 ft. wide, and 8 ft. high?
3. At \$6.75 per cord, find the value of the wood in problem 2.
4. At 96¢ per cubic yard, what will it cost to make an excavation 75 ft. by 48 ft. by 9 ft.?
5. What is the perimeter of a triangular lot when the three sides are $104\frac{5}{8}$ ft., $92\frac{1}{2}$ ft., and $52\frac{3}{4}$ ft.?
6. How many acres are there in a field 40 rd. square?
7. What is the perimeter of a field 84 rd. long and 65 rd. wide?
8. At \$5.90 per square yard, what is the cost of a rug 18 ft. long and 12 ft. wide?
9. A fish pool is 10 ft. long, 8 ft. wide, and 3 ft. deep. How many gallons of water will it hold? (1 cubic foot = $7\frac{1}{2}$ gallons)
10. Find the difference in the area of two lots, one 150 ft. by 80 ft. and the other 135 ft. by 90 ft.

Mixed Practice

Subtract and prove:

- $$\begin{array}{r} 7802 \\ 3779 \\ \hline 4123 \end{array}$$

$$\begin{array}{r} 8093 \\ 1374 \\ \hline 3719 \end{array}$$

$$\begin{array}{r} 7002 \\ 3456 \\ \hline 3646 \end{array}$$

$$\begin{array}{r} 9086 \\ 7695 \\ \hline 2391 \end{array}$$

$$\begin{array}{r} 6906 \\ 2647 \\ \hline 4259 \end{array}$$

$$\begin{array}{r} 8206 \\ 5628 \\ \hline 2578 \end{array}$$
- $$\begin{array}{r} 7050 \\ 3162 \\ \hline 3888 \end{array}$$

$$\begin{array}{r} 9001 \\ 4932 \\ \hline 4069 \end{array}$$

$$\begin{array}{r} 6013 \\ 2376 \\ \hline 3637 \end{array}$$

$$\begin{array}{r} 7605 \\ 1248 \\ \hline 6357 \end{array}$$

$$\begin{array}{r} 3901 \\ 1173 \\ \hline 2728 \end{array}$$

$$\begin{array}{r} 9016 \\ 4259 \\ \hline 4757 \end{array}$$

Multiply the following. Check by multiplying again.

- $$\begin{array}{r} 6492 \\ 68 \\ \hline 441456 \end{array}$$

$$\begin{array}{r} 7538 \\ 94 \\ \hline 708572 \end{array}$$

$$\begin{array}{r} 3648 \\ 73 \\ \hline 266304 \end{array}$$

$$\begin{array}{r} 9275 \\ 507 \\ \hline 4701525 \end{array}$$

$$\begin{array}{r} 3947 \\ 92 \\ \hline 363124 \end{array}$$

$$\begin{array}{r} 2658 \\ 803 \\ \hline 2134374 \end{array}$$

4. Divide each number in row A by each number in row B.

A	4775	6203	8004	7421	9248
B	47	83	59	96	75

Add the following numbers:

- $$\begin{array}{r} 489 \\ 643 \\ 275 \\ 834 \\ 796 \\ \hline 2997 \end{array}$$

$$\begin{array}{r} 458 \\ 267 \\ 395 \\ 673 \\ 194 \\ \hline 1987 \end{array}$$

$$\begin{array}{r} 794 \\ 536 \\ 389 \\ 647 \\ 852 \\ \hline 2618 \end{array}$$

$$\begin{array}{r} 527 \\ 498 \\ 619 \\ 478 \\ 356 \\ \hline 2478 \end{array}$$

$$\begin{array}{r} 839 \\ 356 \\ 467 \\ 583 \\ 582 \\ \hline 2807 \end{array}$$

$$\begin{array}{r} 649 \\ 381 \\ 925 \\ 467 \\ 578 \\ \hline 2990 \end{array}$$
- $$\begin{array}{r} 31\frac{7}{8} \\ 19\frac{11}{16} \\ \hline 50\frac{15}{16} \end{array}$$

$$\begin{array}{r} 46\frac{3}{4} \\ 24\frac{2}{3} \\ \hline 70\frac{11}{12} \end{array}$$

$$\begin{array}{r} 51\frac{2}{3} \\ 64\frac{5}{12} \\ \hline 115\frac{11}{12} \end{array}$$

$$\begin{array}{r} 10\frac{2}{3} \\ 7\frac{7}{8} \\ \hline 17\frac{13}{24} \end{array}$$

$$\begin{array}{r} 6\frac{5}{8} \\ 5\frac{1}{12} \\ \hline 11\frac{16}{24} \end{array}$$

$$\begin{array}{r} 18\frac{4}{5} \\ 9\frac{3}{4} \\ \hline 27\frac{19}{20} \end{array}$$
- $$\begin{array}{r} 25\frac{2}{3} \\ 15\frac{5}{6} \\ \hline 40\frac{7}{6} \end{array}$$

$$\begin{array}{r} 28\frac{4}{5} \\ 16\frac{1}{2} \\ \hline 44\frac{9}{10} \end{array}$$

$$\begin{array}{r} 32\frac{7}{10} \\ 9\frac{3}{5} \\ \hline 41\frac{10}{10} \end{array}$$

$$\begin{array}{r} 43\frac{2}{3} \\ 16\frac{4}{5} \\ \hline 59\frac{14}{15} \end{array}$$

$$\begin{array}{r} 29\frac{4}{5} \\ 30\frac{2}{3} \\ \hline 59\frac{14}{15} \end{array}$$

$$\begin{array}{r} 7\frac{3}{8} \\ 15\frac{5}{6} \\ \hline 22\frac{19}{24} \end{array}$$
- $$\begin{array}{r} 10\frac{3}{4} \\ 8\frac{5}{6} \\ \hline 18\frac{11}{12} \end{array}$$

$$\begin{array}{r} 26\frac{7}{8} \\ 11\frac{3}{4} \\ \hline 38\frac{10}{8} \end{array}$$

$$\begin{array}{r} 16\frac{1}{6} \\ 4\frac{8}{9} \\ \hline 20\frac{5}{18} \end{array}$$

$$\begin{array}{r} 12\frac{3}{4} \\ 6\frac{9}{10} \\ \hline 18\frac{15}{20} \end{array}$$

$$\begin{array}{r} 35\frac{7}{8} \\ 7\frac{5}{24} \\ \hline 42\frac{17}{24} \end{array}$$

$$\begin{array}{r} 6\frac{5}{6} \\ 9\frac{7}{24} \\ \hline 15\frac{17}{24} \end{array}$$

Unit 8. Subtraction of Fractions

Practice in Subtracting Fractions

- $$\frac{5}{6} - \frac{1}{6} = \frac{4}{6} = \frac{2}{3}$$

$$\frac{3}{4} - \frac{1}{2} = \frac{3}{4} - \frac{2}{4} = \frac{1}{4}$$

$$4\frac{3}{4} - 2\frac{2}{3} = 4\frac{9}{12} - 2\frac{8}{12} = 2\frac{1}{12}$$

$$5\frac{2}{3} - 3\frac{1}{6} = 5\frac{4}{6} - 3\frac{1}{6} = 2\frac{3}{6} = 2\frac{1}{2}$$
- $$\frac{7}{8} - \frac{2}{9} = \frac{63}{72} - \frac{16}{72} = \frac{47}{72}$$

$$\frac{11}{12} - \frac{5}{12} = \frac{6}{12} = \frac{1}{2}$$

$$\frac{7}{8} - \frac{1}{2} = \frac{7}{8} - \frac{4}{8} = \frac{3}{8}$$

$$\frac{5}{8} - \frac{1}{4} = \frac{5}{8} - \frac{2}{8} = \frac{3}{8}$$

$$\frac{7}{10} - \frac{1}{2} = \frac{7}{10} - \frac{5}{10} = \frac{2}{10} = \frac{1}{5}$$

$$\frac{5}{6} - \frac{3}{4} = \frac{10}{12} - \frac{9}{12} = \frac{1}{12}$$

$$\frac{7}{8} - \frac{2}{3} = \frac{21}{24} - \frac{16}{24} = \frac{5}{24}$$
- $$2\frac{3}{4} - 1\frac{1}{2} = 2\frac{3}{4} - 1\frac{2}{4} = 1\frac{1}{4}$$

$$7\frac{2}{3} - 4\frac{1}{6} = 7\frac{4}{6} - 4\frac{1}{6} = 3\frac{3}{6} = 3\frac{1}{2}$$

$$5\frac{7}{8} - 2\frac{3}{8} = 3\frac{4}{8} = 3\frac{1}{2}$$

$$5\frac{3}{4} - 2\frac{2}{3} = 5\frac{9}{12} - 2\frac{8}{12} = 3\frac{1}{12}$$

$$8\frac{4}{5} - 3\frac{2}{3} = 8\frac{8}{15} - 3\frac{10}{15} = 5\frac{14}{15}$$
- $$10\frac{5}{12} - 8\frac{7}{12} = 10\frac{5}{12} - 8\frac{7}{12} = 1\frac{10}{12} = 1\frac{5}{6}$$

$$2\frac{1}{4} - 1\frac{1}{4} = 1$$

$$4\frac{7}{8} - 1\frac{1}{4} = 4\frac{7}{8} - 1\frac{2}{8} = 3\frac{5}{8}$$

$$5\frac{7}{8} - 2\frac{3}{4} = 5\frac{7}{8} - 2\frac{6}{8} = 3\frac{1}{8}$$

$$12\frac{5}{16} - 3\frac{1}{8} = 12\frac{5}{16} - 3\frac{2}{16} = 9\frac{3}{16}$$

$$15\frac{1}{2} - 5\frac{7}{8} = 15\frac{4}{8} - 5\frac{7}{8} = 9\frac{1}{8}$$
- $$3\frac{1}{2} - 2\frac{1}{4} = 3\frac{2}{4} - 2\frac{1}{4} = 1\frac{1}{4}$$

$$4\frac{3}{4} - 3\frac{3}{16} = 4\frac{12}{16} - 3\frac{3}{16} = 1\frac{9}{16}$$

$$1\frac{1}{8} - 1\frac{1}{16} = 1\frac{2}{16} - 1\frac{1}{16} = \frac{1}{16}$$

$$7\frac{8}{9} - 2\frac{5}{6} = 7\frac{16}{18} - 2\frac{15}{18} = 5\frac{1}{18}$$

$$54\frac{9}{10} - 46\frac{4}{5} = 54\frac{9}{10} - 46\frac{8}{10} = 8\frac{1}{10}$$

$$5\frac{7}{8} - 2\frac{1}{4} = 5\frac{7}{8} - 2\frac{2}{8} = 3\frac{5}{8}$$
- $$5\frac{7}{8} - 4\frac{1}{4} = 5\frac{7}{8} - 4\frac{2}{8} = 1\frac{5}{8}$$

$$6\frac{2}{3} - 2\frac{2}{3} = 4$$

$$12\frac{5}{8} - 4\frac{1}{4} = 12\frac{5}{8} - 4\frac{2}{8} = 8\frac{3}{8}$$

$$8\frac{7}{16} - 5\frac{1}{4} = 8\frac{7}{16} - 5\frac{4}{16} = 3\frac{3}{16}$$

$$10\frac{1}{2} - 6\frac{3}{8} = 10\frac{4}{8} - 6\frac{3}{8} = 4\frac{1}{8}$$

$$5\frac{1}{2} - 2\frac{7}{16} = 5\frac{8}{16} - 2\frac{7}{16} = 3\frac{1}{16}$$

Problems

- Mary weighs $75\frac{3}{4}$ lb., and Ruth weighs $69\frac{1}{2}$ lb. What is the difference in their weights?
- Anna has $\frac{1}{4}$ of a yard of ribbon. She needs $1\frac{1}{2}$ yards to trim a hat. How much does she lack?
- Helen threw a basketball $46\frac{3}{4}$ feet, and Joan threw it $44\frac{1}{2}$ feet. How much farther did Helen throw it?
- Mrs. Allen bought two chickens weighing $3\frac{7}{8}$ lb. and $4\frac{1}{4}$ lb. Find the weight of both.

Problems

1. Nancy has $1\frac{3}{4}$ yards of goods in one piece and $3\frac{2}{3}$ yards in another. How many yards of goods does she have in both pieces?

2. How many feet of fencing will Mr. Adams need for a garden $28\frac{1}{2}$ ft. by $40\frac{1}{4}$ ft.?

3. A can filled with milk weighs $94\frac{3}{4}$ pounds. When empty, the can weighs $18\frac{1}{2}$ pounds. How many pounds of milk does the can hold?

4. From $12\frac{1}{2}$ yards of dress goods Mrs. Hill used $2\frac{3}{4}$ yards to make a dress for Betty and $3\frac{1}{2}$ yards to make a dress for herself. How many yards were left?

5. The molding around the four walls of a room measures 56 feet. How long is the room if it is 12 feet wide?

6. A dealer paid 85¢ a dozen for tablets and sold them at 10¢ apiece. How much did he make on 5 dozen?

7. Mr. Harper had 7 gal. of gasoline in his car. On a trip he added 8 gal., 10 gal., 15 gal., and 14 gal. When he returned home, he had 12 gal. in the car. How many gallons did he use on the trip?

8. Four girls were partners in raising chickens. They sold 30 chickens at \$1.10 apiece. What was each girl's share from the sales?

9. In one week a storekeeper made deposits of \$487.65, \$623.89, \$589.50, \$810.45, \$512.75, and \$931.27. Find the total of his deposits.

10. For our school entertainment we sold 87 tickets at 50¢ and 184 tickets at 25¢. Our expenses were \$27.40. How much did we make?

Mixed Numbers

1. One package weighs $5\frac{1}{2}$ lb., and another weighs $2\frac{3}{4}$ lb. Find the difference in their weights.

Subtract $2\frac{3}{4}$ from $5\frac{1}{2}$. You cannot take $\frac{3}{4}$ from $\frac{1}{2}$. Add 1, or $\frac{2}{2}$, to $\frac{1}{2}$. Think $5\frac{1}{2} - 2\frac{3}{4} = 4\frac{3}{2} - 2\frac{3}{4} = 4\frac{6}{4} - 2\frac{3}{4} = 2\frac{3}{4}$. In practice, use the short form at the right.

The l.c.d. is 4. Write $\frac{1}{2}$. You cannot take $\frac{3}{4}$ from $\frac{1}{2}$. Think $\frac{1}{2} + \frac{2}{2} = \frac{3}{2} = \frac{6}{4}$. Write 6 for $\frac{6}{4}$ and 3 for $\frac{3}{4}$, as shown. Think $\frac{6}{4} - \frac{3}{4} = \frac{3}{4}$. Write $\frac{3}{4}$. $5 - 1 = 4$. Think $4 - 2 = 2$. The answer is $2\frac{3}{4}$ lb.

$5\frac{1}{2}$	6
$2\frac{3}{4}$	3
$2\frac{3}{4}$	$\frac{3}{4}$

2. Subtract. Use a one-foot ruler to prove each of the remainders.

$$8\frac{1}{2} - 2\frac{3}{8} \quad 4\frac{1}{4} - 2\frac{1}{2} \quad 5\frac{3}{16} - 1\frac{3}{4} \quad 6\frac{1}{8} - 1\frac{1}{4}$$

3. Study the steps in each subtraction below:

$4\frac{1}{2}$	$5\frac{1}{6}$	$6\frac{3}{8}$	$4\frac{1}{4}$
$1\frac{1}{3}$	$3\frac{1}{3}$	$4\frac{7}{8}$	$1\frac{2}{3}$
$2\frac{1}{3}$	$1\frac{5}{6}$	$1\frac{1}{2}$	$2\frac{7}{12}$

To subtract mixed numbers when the upper fraction is the smaller, add 1 to the fraction in the minuend, and take 1 from ones' place in the minuend.

Subtract. To prove, add subtrahend and remainder.

4.	$4\frac{2}{3}$	$8\frac{3}{5}$	$7\frac{4}{8}$	$8\frac{1}{6}$	$5\frac{1}{4}$	$7\frac{1}{10}$
	$2\frac{3}{4}$	$3\frac{4}{5}$	$4\frac{5}{8}$	$6\frac{5}{6}$	$2\frac{1}{2}$	$3\frac{1}{2}$
5.	$6\frac{1}{2}$	$6\frac{7}{8}$	$3\frac{1}{3}$	$9\frac{5}{6}$	$5\frac{1}{8}$	$6\frac{2}{3}$
	$3\frac{7}{8}$	$3\frac{1}{2}$	$1\frac{2}{6}$	$4\frac{1}{3}$	$2\frac{1}{4}$	$4\frac{3}{4}$
6.	$8\frac{1}{8}$	$8\frac{1}{16}$	$8\frac{11}{12}$	$5\frac{7}{8}$	$7\frac{5}{6}$	$10\frac{3}{8}$
	$3\frac{1}{16}$	$7\frac{1}{8}$	$4\frac{7}{8}$	$2\frac{11}{12}$	$6\frac{2}{3}$	$7\frac{1}{2}$



Completing Problems

For each problem supply a missing fact that is needed. Then solve the problems.

- Mrs. Ray bought a vacuum cleaner for \$69. She paid \$13 cash and the balance in monthly installments. How much did she pay each month?
- At \$10 per month, how long will it take Mrs. Johnson to pay the balance due on her radio?
- At the rate of 45¢ a line, how much will Henry have to pay for an advertisement to sell his bicycle?
- At an average speed of 40 miles per hour, how long will it take to drive from one city to another?
- A lot contains 6750 sq. ft. What is its length?
- When turkey sells at 27¢ a pound, what is the cost of 1 turkey?
- Evelyn sold 14 chickens at 18¢ a pound. How much did she get for the chickens?
- What is the value of a turkey weighing 18 lb.?
- How much will a laborer earn for 8 hours' work?
- How many cubic feet of water will it take to fill a swimming pool 50 ft. long and 30 ft. wide?
- Fred earned \$3.60 by working in his father's store. How many hours did he work?
- Find the cost of furnishing a class with arithmetics at 84¢ each, readers at 88¢, and spellers at 48¢.
- Fred's father said he averaged 48 miles per hour. How far did he drive?

Sight Work in Subtracting Fractions

Practice until you can write the remainders correctly.

- | | | | | |
|----------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|
| 1. $\frac{1}{2} - \frac{1}{4}$ | $\frac{1}{4} - \frac{1}{8}$ | $\frac{1}{2} - \frac{1}{3}$ | $\frac{1}{2} - \frac{1}{6}$ | $\frac{1}{2} - \frac{1}{5}$ |
| 2. $\frac{1}{2} - \frac{1}{8}$ | $\frac{1}{2} - \frac{1}{10}$ | $\frac{1}{2} - \frac{1}{12}$ | $\frac{1}{2} - \frac{1}{16}$ | $\frac{1}{3} - \frac{1}{6}$ |
| 3. $\frac{1}{3} - \frac{1}{4}$ | $\frac{1}{3} - \frac{1}{8}$ | $\frac{1}{3} - \frac{1}{9}$ | $\frac{1}{3} - \frac{1}{12}$ | $\frac{1}{4} - \frac{1}{6}$ |
| 4. $\frac{1}{4} - \frac{1}{5}$ | $\frac{1}{4} - \frac{1}{12}$ | $\frac{1}{4} - \frac{1}{16}$ | $\frac{1}{8} - \frac{1}{16}$ | $\frac{1}{2} - \frac{1}{3}$ |
| 5. $\frac{2}{3} - \frac{1}{4}$ | $\frac{2}{3} - \frac{1}{6}$ | $\frac{2}{3} - \frac{1}{8}$ | $\frac{3}{4} - \frac{1}{2}$ | $\frac{3}{4} - \frac{1}{8}$ |
| 6. $\frac{3}{4} - \frac{1}{3}$ | $\frac{3}{4} - \frac{1}{6}$ | $\frac{3}{4} - \frac{5}{12}$ | $\frac{3}{4} - \frac{3}{8}$ | $\frac{3}{4} - \frac{5}{8}$ |
| 7. $\frac{3}{4} - \frac{1}{16}$ | $\frac{5}{8} - \frac{1}{2}$ | $\frac{3}{8} - \frac{1}{4}$ | $\frac{5}{8} - \frac{1}{6}$ | $\frac{7}{8} - \frac{2}{3}$ |
| 8. $\frac{7}{8} - \frac{3}{4}$ | $\frac{7}{8} - \frac{3}{16}$ | $\frac{3}{5} - \frac{1}{2}$ | $\frac{4}{5} - \frac{1}{4}$ | $\frac{3}{5} - \frac{1}{3}$ |
| 9. $\frac{5}{6} - \frac{1}{2}$ | $\frac{5}{6} - \frac{2}{3}$ | $\frac{5}{6} - \frac{3}{4}$ | $\frac{7}{8} - \frac{5}{6}$ | $\frac{4}{9} - \frac{1}{3}$ |
| 10. $2 - \frac{3}{4}$ | $3 - \frac{7}{8}$ | $1\frac{1}{4} - \frac{1}{2}$ | $1\frac{1}{8} - \frac{1}{2}$ | $1\frac{3}{4} - \frac{1}{2}$ |
| 11. $1\frac{1}{8} - \frac{3}{4}$ | $1\frac{1}{2} - \frac{7}{8}$ | $1\frac{1}{3} - \frac{5}{6}$ | $1\frac{3}{4} - \frac{5}{8}$ | $1\frac{1}{5} - \frac{1}{2}$ |

Problems

- Last year Jane weighed $78\frac{1}{2}$ pounds. Now she weighs $91\frac{3}{4}$ pounds. How much has she gained?
- Flora cut $2\frac{1}{4}$ yards of cloth from a piece $5\frac{1}{2}$ yards long. How much was left in the piece?
- A milkman has $4\frac{3}{4}$ gallons of cream. How much more must he get to have $8\frac{1}{2}$ gallons?
- James weighs $92\frac{1}{2}$ pounds. If he gains $5\frac{7}{8}$ pounds, how much will he weigh?
- From a ham weighing $12\frac{1}{4}$ lb., a piece weighing $6\frac{1}{2}$ lb. was cut off. How much of the ham was left?
- A family spent $\frac{1}{6}$ of a yearly income of \$3600 for rent and $\frac{1}{5}$ for food. How much did they have left for other expenses and for savings?

Add, Subtract, Multiply, or Divide?

Write A, S, M, or D for each step. Work the problems.

1. At 24¢ a square foot, what will it cost to lay a cement walk 65 ft. long and 4 ft. wide?
2. At \$85 per acre, what is the value of a farm 160 rd. long and 80 rd. wide?
3. A truck full of coal weighed 12,897 lb. The empty truck weighed 3908 lb. Find the weight of the coal.
4. Mr. Grove owes me \$35. After working 32 hours for me at 85¢ an hour, how much does he still owe?
5. At \$22.50 per week, how much does a stenographer earn in a year if she works 47 weeks of that year?
6. When peaches sell at 2 cans for 39¢, what will 2 dozen cans of peaches cost?
7. At 47 pounds per cubic foot, how many tons of coal will it take to fill a coal bin 12 ft. long, 10 ft. wide, and 6 ft. deep?
8. At \$11.50 per ton, what is the value of the coal in problem 7?
9. Mr. Brown bought 2 lots at \$850 each and another lot for \$1200. Later he sold them all for \$3600. How much did he make on this deal if his expenses were \$250?
10. At his roadside stand Don's father took in \$217.50 in one week. He paid \$17.80 for help and \$147.30 for the fruit he sold. Find his profit for the week.
11. For our school play we sold 341 tickets at 25¢ each and 596 tickets at 15¢. How much money did we get?
12. On Saturday Joe worked from 8:00 A.M. until 11:30 A.M. At 30¢ an hour, how much did he earn?

Second Self-Test

Problem Test

1. Eight inches is what fraction of a yard? Reduce the fraction to lowest terms.
2. At 20 cents a gallon, how many gallons of gasoline can be bought for \$1.50?
3. May bought $2\frac{1}{2}$ dozen eggs at 30 cents a dozen. What was her change from a dollar?
4. Mr. Ray drove his automobile 230 miles in 5 hours. What was the average speed per hour?
5. When apples sell at 4 pounds for a quarter, what will 12 pounds of apples cost?
6. Harold put \$2.50 in the bank each month. How much did he deposit in one year?
7. The price of admission to a school play was 25¢, and \$60.75 was taken in. How many tickets were sold?
8. When coal sells at \$10 a ton, what will 3000 pounds of coal cost?
9. How many feet of fencing will be needed for a rectangular yard 150 ft. long and 60 ft. wide?
10. At 25¢ a quart, what is the cost of 2 gal. of oil?
11. At an average speed of 140 miles per hour, how far will an airplane fly in $5\frac{1}{2}$ hours?
12. At 11 cents a quart, how many gallons of milk can be bought for 88 cents?
13. What is the perimeter of a field that is 65 rods long and 54 rods wide?
14. How much will an auto dealer have to pay for a shipment of 17 new autos at \$785 each?

Testing What You Have Learned

1. A football team won 9 out of 12 games played. What fraction of its games did the team win? Reduce your answer to its lowest terms.
2. Write the formula for finding the area of a rectangle. Write a problem to be solved by this formula.
3. Write the formula for finding the volume of a cube of wood.
4. Write a problem to be solved by each formula below:
(a) Cost $\div$ number = price (b) Distance $\div$ time = speed
(c) Area $\div$ length = width (d) Speed $\times$ time = distance
5. What is the difference between $1\frac{1}{2}$ in. and $\frac{5}{8}$ in.?
6. Reduce to lowest terms: $\frac{35}{50}$, $\frac{75}{100}$, $\frac{27}{36}$, $\frac{16}{24}$, $\frac{16}{36}$, $\frac{32}{96}$.
7. Reduce to simplest form: $\frac{24}{6}$, $\frac{18}{4}$, $\frac{24}{5}$, $\frac{32}{4}$.
8. What fraction of a ton is 1500 pounds?
9. Subtract: $3\frac{3}{4} - 1\frac{1}{2}$ $6\frac{1}{3} - 3\frac{3}{4}$ $4\frac{3}{8} - 1\frac{2}{3}$ $5\frac{3}{4} - 2\frac{5}{8}$
10. Add: $5\frac{3}{4} + 4\frac{5}{8}$ $3\frac{2}{3} + 2\frac{3}{4}$ $8\frac{3}{8} + 3\frac{5}{8}$ $5\frac{2}{3} + 2\frac{7}{12}$
11. When soap sells at 2 bars for 15¢, how much would you pay for 1 bar of soap?
12. What is the perimeter of a field 15 rd. by 25 rd.?
13. A plot of ground is 16 ft. long. How wide must it be to contain 96 sq. ft.?
14. How many acres are there in a field 32 rd. by 25 rd.?
15. A cubic foot is how many cubic inches?
16. What fraction of a cubic yard is 9 cu. ft.?
17. How many cubic inches of water can be put in a one-quart can? (231 cu. in. = 1 gal.)

Unit 9. Multiplication of Fractions

Multiplying Whole Numbers and Fractions

1. At 60¢ a pound, what is the cost of $\frac{3}{4}$ lb. of candy?
Think number $\times$ price = cost. Explain how the work is shortened by canceling 4 from 60 and 4.

$$\frac{3}{4} \times \frac{15}{60} = 45$$

2. Hugh practices his music $\frac{3}{4}$ hr. each day. How long does he practice in 5 days?

$$5 \times \frac{3}{4} = \frac{15}{4} = 3\frac{3}{4}$$

Explain the work shown above. Can this work be shortened by using cancellation?

To find the product of a whole number and a fraction, multiply the whole number by the numerator of the fraction and then divide the product by the denominator. Cancel if possible.

Multiply. Reduce answers to simplest form.

- | | | | | |
|-------------------------|-------------------------|-------------------------|-------------------------|--------------------------|
| 3. $\frac{1}{2}$ of 8 | $\frac{1}{2} \times 8$ | $\frac{2}{3} \times 2$ | $2 \times \frac{2}{3}$ | $5 \times \frac{2}{3}$ |
| 4. $\frac{2}{3}$ of 12 | $\frac{2}{3} \times 12$ | $\frac{3}{8} \times 16$ | $12 \times \frac{3}{4}$ | $10 \times \frac{3}{5}$ |
| 5. $\frac{3}{4}$ of 16 | $\frac{3}{4} \times 9$ | $\frac{2}{3} \times 11$ | $15 \times \frac{3}{4}$ | $20 \times \frac{3}{5}$ |
| 6. $\frac{5}{6}$ of 18 | $\frac{5}{6} \times 15$ | $\frac{3}{4} \times 14$ | $24 \times \frac{5}{6}$ | $32 \times \frac{5}{16}$ |
| 7. $\frac{4}{5}$ of 10 | $\frac{3}{8} \times 10$ | $\frac{1}{6} \times 40$ | $12 \times \frac{7}{8}$ | $24 \times \frac{7}{12}$ |
| 8. $\frac{2}{5}$ of 15 | $\frac{4}{5} \times 8$ | $\frac{1}{3} \times 10$ | $14 \times \frac{2}{3}$ | $25 \times \frac{4}{5}$ |
| 9. $\frac{7}{8}$ of 24 | $\frac{2}{3} \times 7$ | $\frac{3}{4} \times 9$ | $15 \times \frac{2}{5}$ | $30 \times \frac{5}{6}$ |
| 10. $\frac{3}{5}$ of 15 | $\frac{5}{6} \times 9$ | $\frac{5}{8} \times 48$ | $18 \times \frac{2}{9}$ | $40 \times \frac{7}{10}$ |
| 11. $\frac{3}{4}$ of 28 | $\frac{7}{8} \times 32$ | $\frac{4}{5} \times 13$ | $21 \times \frac{7}{3}$ | $60 \times \frac{5}{12}$ |
| 12. $\frac{2}{3}$ of 17 | $\frac{4}{5} \times 19$ | $\frac{3}{4} \times 21$ | $7 \times \frac{3}{4}$ | $6 \times \frac{3}{5}$ |

Add, Subtract, Multiply, or Divide?

Write A, S, M, or D for each step. Work the problems.

1. How many square yards are there in a walk $4\frac{1}{2}$ feet wide and 150 feet long?

2. If 1 gallon of water weighs about $8\frac{1}{3}$ lb., how many pounds of water will be required to fill a 900-gal. tank?

3. Five girls shared the cost of $\frac{1}{2}$ lb. of candy costing \$.50 a pound. Find each girl's share of the cost.

4. How many square yards are there in a piece of carpet 8 yards long and 27 inches wide? Remember that 27 inches equal $\frac{27}{36}$ or $\frac{3}{4}$ of a yard.

5. A garage roof contains 26 square yards. What is the cost of the roof at 12¢ per square foot?

6. At $3\frac{1}{2}$ ¢ per pound, what will 60 lb. of potatoes cost?

7. How many square feet are there in a piece of board 9 inches wide and 12 feet long? (What fraction of a foot is 9 inches?)

8. If a restaurant serves $\frac{2}{3}$ of a pound of turkey for each guest, how many pounds will be required for 80 guests?

9. Dick bought a tie for 50¢, a cap for 75¢, and a shirt for \$1.25. What was his change from \$5?

10. How many square yards are there in a walk 3 feet wide and 90 feet long?

11. If a man's income is \$3000 and he spends $\frac{1}{5}$ of it for rent, how much does he have left for other purposes?

12. On Saturday Arnold worked $1\frac{1}{2}$ hours mowing the lawn, $\frac{1}{2}$ hour cleaning the basement, and $\frac{3}{4}$ hour cleaning the car. How many hours did he work?

13. How far will an automobile go in $4\frac{1}{2}$ hours if it travels at the rate of 38 miles per hour?

Products of Whole Numbers and Fractions

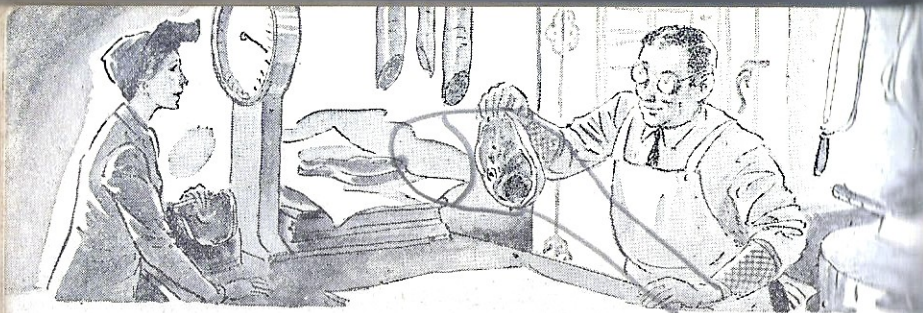
1. At a speed of 165 miles per hour, how far will an airplane fly in 40 min.?

$$\frac{2}{3} \times 165 = 110$$

Think 40 min. = $\frac{40}{60} = \frac{2}{3}$ hr. Cancel 3 from 165 and 3. The answer is 110 mi.

Multiply. Cancel when possible. Reduce answers to simplest form.

2. $\frac{3}{4}$ of 36	$\frac{5}{8}$ of 72	$\frac{3}{4}$ of 96	$\frac{4}{5}$ of 80
3. $\frac{1}{2}$ of 57	$\frac{2}{3}$ of 75	$\frac{3}{8}$ of 36	$\frac{5}{6}$ of 45
4. $\frac{1}{3}$ of 125	$\frac{3}{8}$ of 27	$\frac{3}{4}$ of 35	$\frac{3}{5}$ of 65
5. $\frac{1}{6}$ of 231	$\frac{7}{8}$ of 53	$\frac{2}{3}$ of 160	$\frac{3}{4}$ of 39
6. $\frac{3}{4}$ of 144	$\frac{5}{8}$ of 275	$\frac{5}{8}$ of 197	$\frac{5}{6}$ of 87
7. $9 \times \frac{2}{3}$	$8 \times \frac{1}{4}$	$4 \times \frac{1}{8}$	$6 \times \frac{3}{8}$
8. $4 \times \frac{5}{12}$	$7 \times \frac{1}{7}$	$6 \times \frac{1}{12}$	$16 \times \frac{3}{8}$
9. $5 \times \frac{1}{3}$	$14 \times \frac{5}{6}$	$3 \times \frac{3}{4}$	$12 \times \frac{4}{5}$
10. $7 \times \frac{2}{3}$	$10 \times \frac{4}{9}$	$20 \times \frac{2}{5}$	$18 \times \frac{1}{5}$
11. $7 \times \frac{1}{2}$	$10 \times \frac{3}{5}$	$12 \times \frac{1}{6}$	$13 \times \frac{1}{6}$
12. $\frac{3}{8} \times 45$	$\frac{3}{16} \times 4$	$\frac{2}{7} \times 15$	$\frac{1}{4} \times 5$
13. $\frac{3}{10} \times 5$	$\frac{7}{8} \times 7$	$\frac{3}{4} \times 42$	$\frac{7}{8} \times 19$
14. $\frac{9}{10} \times 20$	$\frac{3}{5} \times 4$	$\frac{5}{8} \times 5$	$\frac{4}{5} \times 7$
15. $\frac{4}{9} \times 27$	$\frac{2}{3} \times 3$	$\frac{5}{6} \times 7$	$\frac{1}{12} \times 5$
16. $\frac{1}{5} \times 6$	$\frac{1}{2} \times 3$	$\frac{2}{3} \times 6$	$\frac{1}{8} \times 7$
17. $\frac{1}{2} \times 89$	$\frac{2}{3} \times 15$	$\frac{3}{4} \times 28$	$\frac{5}{8} \times 16$
18. $\frac{5}{12} \times 24$	$\frac{1}{7} \times 35$	$\frac{3}{10} \times 30$	$\frac{2}{9} \times 18$
19. $\frac{1}{9} \times 45$	$\frac{3}{4} \times 48$	$\frac{7}{12} \times 48$	$\frac{7}{8} \times 5$



Everyday Problems

1. At 33¢ a pound, what did Mrs. Brown pay for $\frac{3}{4}$ lb. of steak?

$$\frac{3}{4} \times 33 = \frac{99}{4} = 24\frac{3}{4}, \text{ or } 25\text{¢}$$

Multiply 33 by $\frac{3}{4}$. Write the numbers as shown in the box above.

The exact cost is $24\frac{3}{4}\text{¢}$. Since retail stores count any fraction of a cent in the cost as 1¢, the real cost is 25¢.

2. Mrs. Brown gave her order to the grocer and received the bill shown at the right. What was the cost of her order?

3. Mrs. Brown also ordered $\frac{7}{8}$ lb. of ham at 42¢ a pound. How much did she pay?

4. Find the cost of $\frac{1}{2}$ pt. of cream at 30¢ a pint and 6 qt. of milk at 14¢ a quart.

5. At 58¢ a pound, what is the cost of $\frac{1}{2}$ lb. of candy?

6. Our automobile gas tank holds 15 gallons. How much gasoline is in the tank when it is $\frac{2}{3}$ full?

J. S. Jones		
Meats and Groceries		
125 Main St., Paris, Missouri		
Telephone Black 1629		
Sold to	Mrs. C. R. Brown	
Address	742 Monroe St.	
$\frac{3}{4}$ lb. butter @ 36¢		
$\frac{1}{4}$ lb. cheese @ 25¢		
2 pecks potatoes @ 30¢		
6 cans peas @ 10¢		
5 lb. sugar @ 5¢		
2 lb. coffee @ 29¢		
$\frac{1}{2}$ lb. cookies @ 28¢		
$\frac{2}{3}$ doz. grapefruit @ 60¢		
Total		

Mixed Practice with Fractions

Add. Reduce the sums to their simplest form.

1. $3\frac{1}{2}$	$4\frac{5}{16}$	$3\frac{5}{8}$	$5\frac{1}{2}$	$4\frac{2}{3}$	$3\frac{7}{12}$	$4\frac{5}{6}$
$\frac{7}{8}$	$7\frac{1}{2}$	$2\frac{9}{16}$	$3\frac{5}{6}$	$1\frac{1}{6}$	$2\frac{1}{2}$	$3\frac{9}{12}$
2. $4\frac{1}{2}$	$3\frac{1}{3}$	$5\frac{3}{4}$	$2\frac{1}{12}$	$6\frac{5}{12}$	$4\frac{5}{6}$	$7\frac{7}{8}$
$1\frac{1}{2}$	$2\frac{3}{4}$	$4\frac{5}{6}$	$3\frac{1}{4}$	$5\frac{2}{3}$	$2\frac{3}{8}$	$5\frac{5}{6}$
3. $5\frac{3}{10}$	$4\frac{4}{5}$	$2\frac{7}{10}$	$4\frac{2}{3}$	$6\frac{2}{3}$	$7\frac{3}{4}$	$5\frac{9}{10}$
$2\frac{1}{2}$	$3\frac{1}{2}$	$5\frac{3}{5}$	$3\frac{4}{9}$	$4\frac{2}{3}$	$6\frac{4}{5}$	$3\frac{3}{4}$

Subtract the following. Reduce the remainders to their simplest form.

4. $4\frac{1}{8}$	$5\frac{3}{4}$	$6\frac{7}{8}$	$7\frac{1}{2}$	6	4	$5\frac{1}{4}$
$2\frac{1}{4}$	$3\frac{1}{2}$	$4\frac{3}{16}$	$3\frac{3}{8}$	$2\frac{7}{8}$	$\frac{2}{3}$	$\frac{1}{2}$
5. $6\frac{1}{3}$	$7\frac{1}{8}$	$4\frac{1}{8}$	$7\frac{1}{2}$	$5\frac{7}{8}$	$6\frac{1}{3}$	$8\frac{2}{3}$
$4\frac{1}{2}$	$3\frac{1}{2}$	$2\frac{1}{4}$	$3\frac{3}{4}$	$2\frac{1}{4}$	$5\frac{1}{2}$	$3\frac{1}{2}$
6. $7\frac{1}{4}$	$5\frac{2}{3}$	$8\frac{1}{6}$	$6\frac{3}{4}$	$4\frac{1}{2}$	$9\frac{3}{8}$	$8\frac{1}{3}$
$3\frac{1}{4}$	$4\frac{3}{4}$	$3\frac{1}{3}$	$2\frac{2}{3}$	$3\frac{7}{12}$	$7\frac{3}{4}$	$4\frac{2}{3}$

Multiply the following. Reduce the products to their simplest form.

7. $3 \times \frac{4}{5}$	$6 \times \frac{2}{3}$	$5 \times \frac{3}{8}$	$11 \times \frac{1}{4}$	$9 \times \frac{5}{6}$
8. $9 \times \frac{1}{2}$	$5 \times \frac{3}{4}$	$4 \times \frac{3}{10}$	$12 \times \frac{2}{3}$	$7 \times \frac{3}{5}$
9. $3 \times \frac{3}{4}$	$4 \times \frac{2}{3}$	$3 \times \frac{1}{12}$	$6 \times \frac{4}{9}$	$8 \times \frac{5}{6}$
10. $\frac{2}{3} \times 8$	$\frac{2}{5} \times 9$	$\frac{5}{6} \times 24$	$\frac{5}{8} \times 5$	$\frac{7}{8} \times 3$
11. $\frac{7}{10} \times 4$	$\frac{2}{5} \times 8$	$\frac{2}{3} \times 10$	$\frac{3}{4} \times 9$	$\frac{3}{4} \times 7$

12. Reduce these fractions to their simplest form:

$\frac{15}{18}$	$\frac{16}{5}$	$\frac{12}{20}$	$\frac{8}{3}$	$\frac{28}{8}$	$\frac{6}{15}$	$\frac{20}{16}$
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Add, Subtract, or Multiply?

Write A, S, or M for each step. Work the problems.

1. Mrs. Thompson bought a table marked to sell for \$25. The dealer reduced the price $\frac{1}{5}$. Find the cost.

2. A lot was priced at \$1500, but later the price was raised $\frac{1}{6}$. What was the price then?

3. Mary's mother used $3\frac{1}{2}$ yards of material for one dress and $4\frac{1}{4}$ yards for another dress. How much did she use for both dresses?

4. A man with a yearly income of \$4200 spent $\frac{1}{5}$ of it for rent, $\frac{1}{6}$ for food, and $\frac{1}{6}$ for clothes. What was the total amount he spent for these three items?

5. Tom's trip to the country required $\frac{3}{8}$ of a day on the train. How many hours was this?

6. At 9¢ a foot, what do 12 yd. of water pipe cost?

7. Dick weighs $90\frac{1}{2}$ lb., and his father weighs $186\frac{1}{4}$ lb. How much less does Dick weigh than his father?

8. A bolt of cloth contained $21\frac{1}{4}$ yards. One piece $3\frac{1}{4}$ yards long and another piece $3\frac{3}{4}$ yards long were cut off. How many yards were left?

9. Walter spent an average of 45 minutes on his arithmetic lesson each day. How many hours did he spend on arithmetic in a school year of 180 days?

10. The boy scout pace is $\frac{5}{8}$ of a yard. How many yards does a scout walk in going 1200 paces?

11. Wheat flour weighs $\frac{4}{5}$ as much as the wheat before it is ground. How many pounds of flour can be made from one bushel of wheat? (1 bu. wheat = 60 lb.)

12. The game room of a house is 20 feet long and $12\frac{1}{2}$ feet wide. At 30¢ per square foot, how much will it cost to put a cement floor in this room?

Unit 10. Multiplying a Fraction by a Fraction

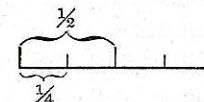
Finding the Product of Two Fractions

By examining an inch of your ruler, you can easily find the answer to each of these questions. **Of** used with fractions means **X**, or **times**.

1. How long is $\frac{1}{2}$ of $\frac{1}{2}$ in.?

2. How long is $\frac{1}{2}$ of $\frac{1}{4}$ in.?

3. How long is $\frac{3}{4}$ of $\frac{1}{2}$ in.?

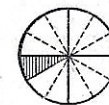
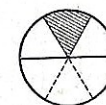


$$\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$$

Use these circles to help you find the products:

4. Find $\frac{1}{3}$ of $\frac{1}{2}$. $\frac{1}{3} \times \frac{1}{2} = \underline{\hspace{1cm}}$?

5. What is the product of $\frac{1}{2}$ and $\frac{1}{3}$?



6. What fraction of the circle is $\frac{1}{3} \times \frac{1}{2}$?

$$\frac{1}{3} \text{ of } \frac{1}{2} = \frac{1}{6} \quad \frac{1}{3} \times \frac{1}{4} = \frac{1}{12}$$

7. What is the product of $\frac{2}{3}$ and $\frac{1}{4}$?

To find the product of two fractions, first multiply the numerators and then the denominators.

Multiply. Reduce products to simplest form.

8. $\frac{1}{2} \times \frac{1}{3} = \frac{1}{6}$ $\frac{1}{3} \times \frac{2}{3} = \frac{2}{9}$ $\frac{2}{3} \times \frac{1}{4} = \frac{2}{12} = \frac{1}{6}$

9. $\frac{2}{3} \times \frac{2}{3}$ $\frac{1}{4} \times \frac{3}{8}$ $\frac{1}{5} \times \frac{1}{4}$ $\frac{5}{8} \times \frac{1}{2}$ $\frac{3}{8} \times \frac{3}{4}$

10. $\frac{1}{2} \times \frac{3}{4}$ $\frac{5}{12} \times \frac{1}{2}$ $\frac{7}{8} \times \frac{5}{6}$ $\frac{1}{3} \times \frac{1}{4}$ $\frac{3}{4} \times \frac{7}{8}$

11. $\frac{1}{3} \times \frac{5}{6}$ $\frac{1}{2} \times \frac{1}{5}$ $\frac{1}{2} \times \frac{7}{8}$ $\frac{1}{2} \times \frac{1}{6}$ $\frac{1}{2} \times \frac{5}{6}$

12. $\frac{3}{8} \times \frac{1}{3}$ $\frac{1}{4} \times \frac{3}{5}$ $\frac{4}{5} \times \frac{3}{4}$ $\frac{2}{3} \times \frac{2}{5}$ $\frac{3}{4} \times \frac{3}{4}$

13. $\frac{1}{2} \times \frac{1}{8}$ $\frac{1}{6} \times \frac{1}{3}$ $\frac{3}{4} \times \frac{5}{8}$ $\frac{1}{8} \times \frac{3}{4}$ $\frac{1}{5} \times \frac{1}{3}$

Problems in Cancellation

1. Mr. Jones has a field 60 rods wide and 120 rods long. How many acres has he in this field?

The number of square rods is 60×120 . This product divided by 160 will give the number of acres. The work to be done may be indicated by the statement, $60 \times 120 \div 160$. See how the work is shortened by canceling.

$$\frac{60 \times 120}{160} = 45$$

2. How many acres are there in a field 120 rods by 200 rods?

3. How many square yards are there in a room 18 feet wide and 24 feet long?

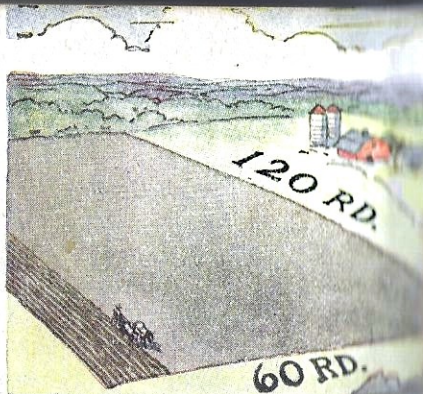
4. How many acres are there in a park 100 rd. by 130 rd.?

5. What is the number of cords of wood in a pile 6 feet high and 80 feet long if the wood is 4 feet long? There are 128 cubic feet in a cord.

Practice in Cancellation

Work the following examples by cancellation:

- | | | | |
|--------------------------------|-----------------------------------|------------------------------------|-------------------------------------|
| 1. $\frac{12 \times 18}{16}$ | $\frac{15 \times 24}{18}$ | $\frac{42 \times 54}{24}$ | $\frac{72 \times 48}{16 \times 18}$ |
| 2. $\frac{21 \times 14}{30}$ | $\frac{56 \times 72}{48}$ | $\frac{63 \times 84}{54}$ | $\frac{81 \times 38}{19 \times 27}$ |
| 3. $\frac{40 \times 180}{160}$ | $\frac{6 \times 8 \times 12}{27}$ | $\frac{8 \times 39}{18 \times 26}$ | $\frac{51 \times 87}{36 \times 29}$ |

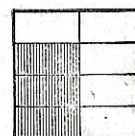


Multiplication of Fractions

1. Mary bought $\frac{3}{4}$ yd. of percale. She used one half of the piece to make a doll's dress. What fraction of a yard did she use?



To understand $\frac{1}{2} \times \frac{3}{4}$, draw a square. Divide the square into fourths. Then divide the fourths into eighths. Shade $\frac{1}{2}$ of $\frac{3}{4}$. The shaded parts show that Mary used $\frac{3}{8}$ yd.



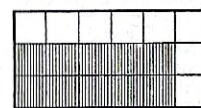
2. Draw a 2-inch square and copy the figure at the right. Show that $\frac{1}{2} \times \frac{3}{4} = \frac{3}{8}$.

$$\frac{1}{2} \times \frac{3}{4} = \frac{3}{8}$$

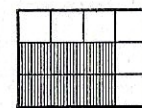
3. Explain how the shaded parts in each of the drawings below show the product of two fractions. Then copy each drawing, with parts as shown. In planning these drawings, it is convenient to make the small squares $\frac{1}{4}$ in., $\frac{1}{2}$ in., or 1 in. square.



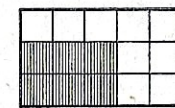
$$\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$$



$$\frac{2}{3} \times \frac{5}{6} = \frac{10}{18} = \frac{5}{9}$$



$$\frac{2}{3} \times \frac{3}{4} = \frac{6}{12} = \frac{1}{2}$$



$$\frac{2}{3} \times \frac{3}{5} = \frac{6}{15} = \frac{2}{5}$$

Multiply the fractions below. Cancel when you can.

- | | | | | |
|-------------------------------------|----------------------------------|----------------------------------|----------------------------------|-----------------------------------|
| 4. $\frac{3}{4} \times \frac{1}{2}$ | $\frac{3}{8} \times \frac{2}{3}$ | $\frac{2}{3} \times \frac{3}{4}$ | $\frac{3}{4} \times \frac{2}{3}$ | $\frac{3}{8} \times \frac{7}{12}$ |
| 5. $\frac{3}{4} \times \frac{5}{6}$ | $\frac{5}{6} \times \frac{1}{2}$ | $\frac{3}{5} \times \frac{5}{8}$ | $\frac{2}{3} \times \frac{4}{5}$ | $\frac{1}{5} \times \frac{3}{8}$ |
| 6. $\frac{3}{4} \times \frac{4}{5}$ | $\frac{1}{5} \times \frac{1}{6}$ | $\frac{3}{4} \times \frac{1}{6}$ | $\frac{1}{4} \times \frac{1}{3}$ | $\frac{5}{6} \times \frac{3}{4}$ |
| 7. $\frac{1}{6} \times \frac{3}{4}$ | $\frac{1}{4} \times \frac{2}{3}$ | $\frac{1}{6} \times \frac{4}{5}$ | $\frac{5}{6} \times \frac{3}{8}$ | $\frac{3}{5} \times \frac{2}{3}$ |
| 8. $\frac{1}{4} \times \frac{7}{8}$ | $\frac{3}{4} \times \frac{2}{5}$ | $\frac{5}{8} \times \frac{4}{5}$ | $\frac{3}{4} \times \frac{5}{6}$ | $\frac{3}{5} \times \frac{3}{4}$ |
| 9. $\frac{1}{6} \times 30$ | $\frac{3}{4} \times 16$ | $\frac{5}{8} \times 24$ | $\frac{2}{3} \times 16$ | $\frac{5}{8} \times 10$ |

Problems

1. How many cubic yards are there in a box 2 yd. long, $\frac{4}{5}$ yd. wide, and $\frac{1}{4}$ yd. deep?
2. How many square yards are in a floor 6 ft. by 12 ft.?
3. The Lincoln School has a $\frac{1}{4}$ -mile track. A boy who has covered $\frac{3}{4}$ of the distance has run what part of a mile?
4. How far can John walk in $\frac{3}{4}$ hour if he goes at the rate of 4 miles per hour?
5. At 36¢ per pound, what should Mrs. Jones pay for a steak weighing $\frac{7}{8}$ lb.?
6. Mary and Ruth divided $\frac{7}{8}$ lb. of candy equally between them. What fraction of a pound did each girl get?
7. Mr. Miller wants to fence in a chicken yard 12 yards square. What will the fencing cost at \$.75 per yard?
8. The excavation for a basement was 27 feet by 30 feet by 5 feet. What was the cost at 45¢ a cubic yard?
9. How many square yards are there in a rectangle 27 inches by 24 inches? (What fractions of a yard are these dimensions?)
10. Mr. Baker received \$474 on a debt. He decided to use $\frac{1}{3}$ of it for expenses and to invest the remainder. How much did he have to invest?
11. A tenant raised 792 bushels of corn and gave $\frac{2}{5}$ of it for rent. How much did the tenant keep?
12. If a man spends 40 minutes a day reading the paper, how many hours does he spend in this way during 6 days? (What fraction of an hour is 40 min.?)
13. In drying, apples lose $\frac{5}{8}$ of their weight. How many pounds of dried apples can you get from 1200 pounds of apples?

Reducing Mixed Numbers to Improper Fractions

1. Use your ruler to show that $4\frac{1}{2}$ inches equal $\frac{9}{2}$ inches.

Think $4 \times \frac{2}{2} = \frac{8}{2}$; then think $\frac{8}{2} + \frac{1}{2} = \frac{9}{2}$.

$$\frac{4 \times 2 + 1}{2} = \frac{9}{2}$$

To reduce a mixed number to an improper fraction, multiply the whole number by the denominator, add the numerator, and write the result over the denominator.

Change these mixed numbers to improper fractions:

1. $3\frac{1}{2}$ $2\frac{1}{3}$ $1\frac{1}{6}$ $2\frac{1}{9}$ $3\frac{1}{2}$ $8\frac{1}{3}$ $2\frac{1}{4}$ $6\frac{1}{4}$
2. $4\frac{1}{2}$ $1\frac{1}{12}$ $4\frac{2}{3}$ $16\frac{1}{2}$ $1\frac{5}{7}$ $3\frac{3}{8}$ $3\frac{4}{9}$ $6\frac{3}{5}$
3. $2\frac{7}{12}$ $1\frac{1}{4}$ $2\frac{8}{9}$ $21\frac{5}{8}$ $3\frac{2}{5}$ $14\frac{5}{6}$ $2\frac{5}{8}$ $3\frac{7}{10}$
4. $1\frac{1}{8}$ $3\frac{7}{8}$ $18\frac{3}{4}$ $4\frac{3}{4}$ $3\frac{5}{12}$ $7\frac{4}{5}$ $4\frac{5}{6}$ $2\frac{7}{12}$
5. $6\frac{1}{8}$ $49\frac{1}{2}$ $33\frac{1}{3}$ $3\frac{2}{7}$ $37\frac{1}{2}$ $3\frac{6}{7}$ $6\frac{5}{9}$ $6\frac{1}{12}$

Multiplying Mixed Numbers by Fractions

1. If it takes $1\frac{7}{8}$ bu. of wheat to sow an acre of land, how many bushels will it take to sow $\frac{2}{3}$ of an acre?

Change $1\frac{7}{8}$ to $\frac{15}{8}$ and then multiply $\frac{15}{8}$ by $\frac{2}{3}$. The work is shortened by canceling 3 from 15 and 3, and 2 from 8 and 8.

$$1\frac{7}{8} \times \frac{2}{3} = \frac{15}{8} \times \frac{2}{3} = \frac{5}{4} = 1\frac{1}{4}$$

Multiply. Reduce products to simplest form.

1. $\frac{3}{4} \times 6\frac{2}{3}$ $\frac{5}{6} \times 1\frac{7}{8}$ $\frac{1}{4} \times 3\frac{1}{3}$ $\frac{5}{6} \times 1\frac{3}{5}$ $\frac{7}{8} \times 2\frac{2}{3}$
2. $7\frac{1}{2} \times \frac{3}{4}$ $2\frac{1}{4} \times \frac{5}{6}$ $3\frac{3}{4} \times \frac{5}{6}$ $2\frac{1}{2} \times \frac{2}{5}$ $5\frac{1}{3} \times \frac{3}{4}$
3. $\frac{4}{5} \times 3\frac{5}{8}$ $\frac{5}{6} \times 2\frac{1}{10}$ $\frac{3}{16} \times 1\frac{1}{3}$ $\frac{4}{5} \times 2\frac{2}{9}$ $\frac{1}{8} \times 3\frac{1}{5}$

Add, Subtract, Multiply, or Divide?

Write A, S, M, or D for each step. Work the problems.

1. In a tank $3\frac{1}{2}$ ft. wide and 10 ft. long, the water is $\frac{3}{4}$ ft. deep. How many cubic feet of water are there?
2. The man who repaired our furnace charged \$1.30 an hour for 11 hours' work and \$7.80 for material. What was the cost of the repairing?
3. The scouts practiced tying knots for an average of 45 min. a day. How many hours did they practice in 12 days?
4. If potatoes sell for 25¢ a peck, how much do you save on a bushel by buying them at 90¢ a bushel?
5. Edith gave her kittens 1 pint of milk each day. How many quarts of milk did they drink in 3 weeks?
6. Jack bought used golf balls at \$3 per dozen and sold them at 45¢ each. What was his profit on each ball?
7. Irene got \$12 from the sale of 10 hens. Her expenses were \$4. What was the gain per hen?
8. At an average speed of 145 miles per hour, how far will an airplane fly in $4\frac{1}{2}$ hours?
9. In making a home run, how many yards must a player run on a baseball diamond that is 90 ft. square?
10. A bin contains 1240 cu. ft. How many bushels of wheat will it hold? (1 cu. ft. of wheat = $\frac{4}{5}$ bu.)
11. Narrow strips of cloth $\frac{7}{8}$ in. wide (with allowance for seams) are used for making a quilt. How many feet wide will a quilt be for which 72 of these strips are used?
12. A merchant mailed 34 packages, each weighing 14 ounces. How many pounds did these packages weigh?
13. How many square yards of concrete are needed for a basement floor 54 ft. long and 46 ft. wide?



Unit 11. Multiplying Mixed Numbers

The Product of Two Mixed Numbers

1. At a speed of $2\frac{3}{4}$ miles per hour, how far will a boy scout troop hike in $4\frac{1}{2}$ hours?

Reduce the mixed numbers to improper fractions; then multiply. The answer is $12\frac{3}{8}$ mi.

$$2\frac{3}{4} = \frac{11}{4} \quad 4\frac{1}{2} = \frac{9}{2}$$

$$\frac{11}{4} \times \frac{9}{2} = \frac{99}{8} = 12\frac{3}{8}$$

2. Multiply $22\frac{1}{2}$ by $4\frac{4}{5}$.

Reduce the mixed numbers to improper fractions; then multiply. To shorten the work, cancel 5 from 45 and 5, and 2 from 44 and 2.

$$22\frac{1}{2} = \frac{45}{2} \quad 4\frac{4}{5} = \frac{24}{5}$$

$$\frac{45}{2} \times \frac{24}{5} = 108$$

To multiply a mixed number by a mixed number, first reduce the mixed numbers to improper fractions; then multiply.

- | | | | | |
|---------------------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|
| 1. $6\frac{3}{4} \times 1\frac{3}{4}$ | $7\frac{1}{5} \times 2\frac{1}{8}$ | $2\frac{1}{2} \times 2\frac{2}{3}$ | $3\frac{3}{8} \times \frac{2}{3}$ | $4\frac{3}{8} \times \frac{3}{5}$ |
| 2. $1\frac{1}{4} \times 3\frac{1}{3}$ | $\frac{3}{8} \times 1\frac{1}{3}$ | $2\frac{2}{3} \times 3\frac{3}{4}$ | $5\frac{2}{5} \times 2\frac{1}{2}$ | $\frac{5}{12} \times 1\frac{3}{5}$ |
| 3. $6\frac{1}{4} \times 3\frac{2}{3}$ | $3\frac{1}{3} \times 4\frac{1}{5}$ | $10\frac{2}{3} \times \frac{5}{6}$ | $1\frac{1}{3} \times 1\frac{1}{8}$ | $6\frac{3}{4} \times \frac{8}{9}$ |
| 4. $5\frac{3}{8} \times 5\frac{1}{4}$ | $2\frac{1}{2} \times \frac{3}{10}$ | $2\frac{1}{8} \times 1\frac{1}{3}$ | $1\frac{1}{5} \times 1\frac{7}{8}$ | $\frac{2}{3} \times 7\frac{1}{2}$ |
| 5. $2\frac{3}{8} \times 1\frac{3}{5}$ | $8\frac{1}{2} \times 2\frac{2}{3}$ | $\frac{5}{6} \times 1\frac{1}{5}$ | $\frac{2}{3} \times 3\frac{9}{10}$ | $3\frac{3}{4} \times \frac{7}{9}$ |
| 6. $8\frac{1}{4} \times \frac{5}{6}$ | $2\frac{1}{2} \times 2\frac{1}{2}$ | $8\frac{3}{4} \times 5\frac{1}{5}$ | $1\frac{1}{3} \times 1\frac{7}{8}$ | $2\frac{3}{4} \times 2\frac{2}{3}$ |
| 7. $6\frac{1}{2} \times 2\frac{1}{2}$ | $4\frac{2}{5} \times 2\frac{1}{4}$ | $\frac{1}{6} \times 4\frac{1}{2}$ | $3\frac{1}{4} \times 1\frac{2}{3}$ | $3\frac{3}{8} \times 1\frac{1}{3}$ |

Add, Subtract, Multiply, or Divide?

Write A, S, M, or D for each step. Work the problems.

1. Some boards were sawed $\frac{7}{8}$ of an inch thick. If 32 of these boards were placed on top of each other, how many feet high would the pile be?

2. Using $1\frac{1}{8}$ bushels of seed corn per acre, how many bushels will a farmer use for a field of $12\frac{1}{2}$ acres?

3. A rectangle is 4 ft. 9 in. by 7 ft. 4 in. What is its area in square feet? (Use mixed numbers.)

4. The sixth-grade pupils bought $57\frac{1}{2}$ yards of material for costumes for a play. At $16\frac{2}{3}$ cents a yard, how much did the material cost? ($16\frac{2}{3}\text{¢} = \$\frac{1}{6}$.)

5. An oriental rug was 6 ft. 9 in. wide and 9 ft. 4 in. long. How many square yards were there in this rug?

6. Ethel sold $3\frac{1}{2}$ quarts of berries at $12\frac{1}{2}\text{¢}$ a quart. How much did she receive for the berries?

7. If $\frac{5}{8}$ lb. of sugar is used in canning 1 qt. of quinces, how many pounds are used in canning 48 qt.?

8. At $1\frac{7}{8}\text{¢}$ per mile, what will railroad fare cost for a trip of $16\frac{1}{2}$ miles?

9. A box is $1\frac{1}{2}$ ft. wide, $4\frac{2}{3}$ ft. long, and $2\frac{1}{4}$ ft. deep. How many cubic feet does it contain?

10. An excavation for a basement is 36 ft. by 44 ft. by 5 ft. How many cubic yards of dirt were removed?

11. What did Mrs. Brown pay for a $3\frac{1}{4}$ -lb. chicken at $28\frac{1}{2}\text{¢}$ per pound?

12. A lot contained $\frac{7}{8}$ of an acre, of which $\frac{1}{3}$ was in lawn. What fraction of an acre was there in lawn?

13. At an average speed of 45 miles an hour, how far will an automobile go in 40 minutes?

Multiplying Whole Numbers by Mixed Numbers

1. At an average speed of 175 miles per hour, how far will an airplane fly in $6\frac{3}{4}$ hours?

Multiply 175 by $\frac{3}{4}$; then by 6. To multiply by $\frac{3}{4}$, multiply 175 by 3 and divide the result by 4.

Step 1. Multiply 175 by 3. Write 525.

Step 2. Divide 525 by 4. Write $131\frac{1}{4}$.

Step 3. Multiply 175 by 6. Write 1050.

Step 4. Add $131\frac{1}{4}$ and 1050. Write 1181 $\frac{1}{4}$.

$$\begin{array}{r} 175 \\ 6\frac{3}{4} \\ \hline 4\overline{)525} \\ \underline{131\frac{1}{4}} \\ 1050 \\ \underline{1181\frac{1}{4}} \end{array}$$

2. At 35¢ a dozen, what is the cost of $4\frac{1}{2}$ dozen eggs?

Step 1. Divide 35 by 2. Write $17\frac{1}{2}$.

Step 2. Multiply 35 by 4. Write 140.

Step 3. Add $17\frac{1}{2}$ and 140. Write $\$1.57\frac{1}{2}$. Count $\frac{1}{2}\text{¢}$ as 1¢. The cost is \$1.58.

$$\begin{array}{r} \$.35 \\ 4\frac{1}{2} \\ \hline 17\frac{1}{2} \\ 140 \\ \hline \$1.57\frac{1}{2} \end{array}$$

Multiply the following. Check by multiplying again.

$$\begin{array}{r} 3. \quad \begin{array}{r} 25 \\ 7\frac{1}{2} \\ \hline \end{array} \quad \begin{array}{r} 48 \\ 5\frac{3}{4} \\ \hline \end{array} \quad \begin{array}{r} 16 \\ 4\frac{2}{3} \\ \hline \end{array} \quad \begin{array}{r} 17 \\ 8\frac{1}{4} \\ \hline \end{array} \quad \begin{array}{r} 32 \\ 12\frac{5}{8} \\ \hline \end{array} \quad \begin{array}{r} 29 \\ 4\frac{1}{3} \\ \hline \end{array} \quad \begin{array}{r} 62 \\ 15\frac{1}{8} \\ \hline \end{array} \end{array}$$

$$\begin{array}{r} 4. \quad \begin{array}{r} 14\frac{1}{2} \\ 9 \\ \hline \end{array} \quad \begin{array}{r} 25 \\ 2\frac{3}{4} \\ \hline \end{array} \quad \begin{array}{r} 11 \\ 3\frac{2}{5} \\ \hline \end{array} \quad \begin{array}{r} 75 \\ 12\frac{1}{2} \\ \hline \end{array} \quad \begin{array}{r} 25 \\ 5\frac{3}{8} \\ \hline \end{array} \quad \begin{array}{r} 16\frac{1}{3} \\ 9 \\ \hline \end{array} \quad \begin{array}{r} 12\frac{1}{8} \\ 18 \\ \hline \end{array} \end{array}$$

$$\begin{array}{r} 5. \quad \begin{array}{r} 35 \\ 6\frac{1}{6} \\ \hline \end{array} \quad \begin{array}{r} 20 \\ 16\frac{2}{3} \\ \hline \end{array} \quad \begin{array}{r} 31 \\ 5\frac{1}{4} \\ \hline \end{array} \quad \begin{array}{r} 25 \\ 2\frac{5}{8} \\ \hline \end{array} \quad \begin{array}{r} 17 \\ 6\frac{2}{3} \\ \hline \end{array} \quad \begin{array}{r} 24 \\ 15\frac{5}{6} \\ \hline \end{array} \quad \begin{array}{r} 27\frac{1}{2} \\ 8 \\ \hline \end{array} \end{array}$$

$$\begin{array}{r} 6. \quad \begin{array}{r} 35\frac{1}{2} \\ 14 \\ \hline \end{array} \quad \begin{array}{r} 16\frac{3}{8} \\ 4 \\ \hline \end{array} \quad \begin{array}{r} 42 \\ 6\frac{7}{8} \\ \hline \end{array} \quad \begin{array}{r} 36\frac{2}{3} \\ 4 \\ \hline \end{array} \quad \begin{array}{r} 19\frac{3}{4} \\ 12 \\ \hline \end{array} \quad \begin{array}{r} 45 \\ 14\frac{1}{3} \\ \hline \end{array} \quad \begin{array}{r} 19 \\ 8\frac{3}{4} \\ \hline \end{array} \end{array}$$

$$\begin{array}{r} 7. \quad \begin{array}{r} 15 \\ 3\frac{7}{8} \\ \hline \end{array} \quad \begin{array}{r} 96 \\ 4\frac{3}{4} \\ \hline \end{array} \quad \begin{array}{r} 28 \\ 7\frac{2}{3} \\ \hline \end{array} \quad \begin{array}{r} 45 \\ 8\frac{7}{8} \\ \hline \end{array} \quad \begin{array}{r} 17\frac{3}{4} \\ 6 \\ \hline \end{array} \quad \begin{array}{r} 80 \\ 3\frac{2}{3} \\ \hline \end{array} \quad \begin{array}{r} 26 \\ 5\frac{3}{8} \\ \hline \end{array} \end{array}$$

Fractions in Problems

1. If a baby gains an average of 4 ounces a week, how many pounds will it gain in 13 weeks?
2. When oranges sell at 30¢ a dozen, what is the cost of $2\frac{1}{2}$ dozen oranges?
3. At an average speed of 165 miles per hour, how far will an airplane fly in $4\frac{3}{4}$ hours?
4. What did I get for $8\frac{1}{2}$ qt. of berries at 14¢ a quart?
5. How many cubic feet of coal will a bin hold which is 12 feet long, 8 feet wide, and $5\frac{1}{2}$ feet deep?
6. At an average speed of 46 miles per hour, how far will a train go in 6 hours and 10 minutes?
7. When 72 narrow flooring boards, each $2\frac{7}{8}$ inches wide, are laid side by side in a floor, what is the total width of these strips in feet?
8. At 80¢ a yard, what is the cost of $3\frac{3}{4}$ yards of silk?
9. Mrs. Ames bought $\frac{1}{4}$ lb. of shelled walnuts. If she uses $\frac{1}{3}$ of them for a cake, what fraction of a pound will she have left?
10. A milkman has 17 quarts of milk in his wagon. How many more quarts must he get to have $12\frac{1}{2}$ gallons?
11. Mr. Brown has a garden $36\frac{1}{2}$ ft. by $28\frac{1}{4}$ ft. How many feet of fencing will it take to go around this garden?
12. A can filled with milk weighs $74\frac{3}{8}$ pounds. When empty, the can weighs $16\frac{1}{2}$ pounds. How many pounds of milk are there in the can?
13. Mr. Brown received a load of coal weighing 6500 pounds. What did the coal cost him at \$14 a ton?
14. How many bushels of wheat are there in 63 sacks, each containing 80 pounds? (80 lb. of wheat = $1\frac{1}{3}$ bu.)

Mixed Work in Fractions

- | | | | | |
|----------------------------------|-------------------------------|------------------------------------|---------------------------------|------------------------------------|
| 1. $\frac{1}{2} + \frac{1}{4}$ | $\frac{1}{2} - \frac{1}{4}$ | $\frac{1}{2} \times \frac{1}{4}$ | $\frac{1}{2}$ of $2\frac{1}{2}$ | $4\frac{3}{8} - 2\frac{7}{8}$ |
| 2. $\frac{3}{4} + \frac{2}{3}$ | $\frac{3}{4} - \frac{2}{3}$ | $\frac{3}{4} \times \frac{2}{3}$ | $\frac{2}{3}$ of $\frac{3}{4}$ | $6\frac{2}{3} + 4\frac{5}{6}$ |
| 3. $\frac{5}{6} + \frac{3}{4}$ | $\frac{5}{6} - \frac{3}{4}$ | $\frac{5}{6} \times \frac{3}{4}$ | $\frac{3}{4}$ of $2\frac{1}{2}$ | $2\frac{1}{3} \times 4\frac{1}{2}$ |
| 4. $3\frac{1}{2} + \frac{7}{8}$ | $3\frac{1}{2} - \frac{7}{8}$ | $3\frac{1}{2} \times \frac{7}{8}$ | $\frac{2}{3}$ of $3\frac{1}{3}$ | $3\frac{1}{4} - 1\frac{2}{3}$ |
| 5. $4\frac{1}{4} + 2\frac{2}{3}$ | $4\frac{1}{4} - 2\frac{2}{3}$ | $4\frac{1}{4} \times 2\frac{2}{3}$ | $\frac{1}{4}$ of $2\frac{2}{3}$ | $2\frac{3}{4} + 3\frac{5}{6}$ |

Find the products of the following:

- | | | | | |
|---|--|--|---|---|
| 6. $\frac{3}{8} \times \frac{2}{3}$ | $\frac{9}{16} \times \frac{2}{3}$ | $\frac{4}{5} \times \frac{2}{3}$ | $\frac{11}{12} \times \frac{4}{5}$ | $\frac{7}{8} \times \frac{9}{10}$ |
| 7. $\frac{3}{8} \times 8$ | $\frac{7}{10} \times 12$ | $1\frac{5}{6} \times 20$ | $1\frac{1}{2} \times 21$ | $\frac{5}{16} \times 3\frac{1}{5}$ |
| 8. $2\frac{1}{4} \times 3\frac{1}{5}$ | $4\frac{2}{3} \times 3\frac{3}{4}$ | $6\frac{2}{3} \times 7\frac{1}{2}$ | $3\frac{1}{3} \times 3\frac{2}{3}$ | $3\frac{1}{8} \times 1\frac{1}{5}$ |
| 9. $\begin{array}{r} 25 \\ 4\frac{3}{4} \end{array}$ | $\begin{array}{r} 24\frac{3}{4} \\ 15 \end{array}$ | $\begin{array}{r} 12\frac{3}{5} \\ 30 \end{array}$ | $\begin{array}{r} 35 \\ 4\frac{3}{8} \end{array}$ | $\begin{array}{r} 49 \\ 3\frac{1}{2} \end{array}$ |
| | $\begin{array}{r} 18 \\ 2\frac{5}{6} \end{array}$ | $\begin{array}{r} 24\frac{7}{8} \\ 8 \end{array}$ | | |
| 10. $\begin{array}{r} 45 \\ 6\frac{3}{8} \end{array}$ | $\begin{array}{r} 27 \\ 4\frac{1}{2} \end{array}$ | $\begin{array}{r} 33 \\ 3\frac{7}{8} \end{array}$ | $\begin{array}{r} 13 \\ 2\frac{2}{3} \end{array}$ | $\begin{array}{r} 17 \\ 4\frac{3}{4} \end{array}$ |
| | $\begin{array}{r} 27 \\ 5\frac{2}{3} \end{array}$ | $\begin{array}{r} 42\frac{3}{4} \\ 9 \end{array}$ | | |

Add the following:

- | | | | | | | | |
|--|---|--|---|--|--|---|--|
| 11. $\begin{array}{r} 4\frac{1}{2} \\ 3\frac{1}{4} \\ 7\frac{1}{4} \end{array}$ | $\begin{array}{r} 3\frac{5}{8} \\ 7\frac{2}{3} \\ 5\frac{1}{6} \end{array}$ | $\begin{array}{r} 4\frac{5}{8} \\ 3\frac{3}{4} \\ 6\frac{1}{12} \end{array}$ | $\begin{array}{r} 2\frac{1}{4} \\ 6\frac{1}{3} \\ 2\frac{3}{8} \end{array}$ | $\begin{array}{r} 5\frac{7}{8} \\ 4\frac{5}{16} \\ 1\frac{3}{4} \end{array}$ | $\begin{array}{r} 3\frac{9}{10} \\ 7\frac{2}{5} \\ 3\frac{1}{2} \end{array}$ | $\begin{array}{r} 5\frac{5}{6} \\ 1\frac{2}{3} \\ 4\frac{1}{2} \end{array}$ | $\begin{array}{r} 6\frac{3}{4} \\ 5\frac{1}{8} \\ 3\frac{1}{2} \end{array}$ |
| 12. $\begin{array}{r} 5\frac{5}{16} \\ 8\frac{7}{8} \\ 6\frac{1}{4} \end{array}$ | $\begin{array}{r} 2\frac{1}{2} \\ 5\frac{3}{5} \\ 2\frac{3}{4} \end{array}$ | $\begin{array}{r} 3\frac{1}{2} \\ 2\frac{7}{10} \\ 4\frac{4}{5} \end{array}$ | $\begin{array}{r} 6\frac{1}{6} \\ 4\frac{2}{3} \\ 2\frac{2}{9} \end{array}$ | $\begin{array}{r} 7\frac{2}{3} \\ 5\frac{3}{4} \\ 3\frac{1}{2} \end{array}$ | $\begin{array}{r} 1\frac{5}{8} \\ 3\frac{3}{4} \\ 5\frac{5}{8} \end{array}$ | $\begin{array}{r} 5\frac{3}{4} \\ 6\frac{5}{8} \\ 6\frac{1}{2} \end{array}$ | $\begin{array}{r} 8\frac{1}{5} \\ 9\frac{1}{10} \\ 7\frac{1}{2} \end{array}$ |

Subtract the following:

- | | | | | | | | |
|---|--|--|--|--|---|---|---|
| 13. $\begin{array}{r} 5\frac{1}{4} \\ 2\frac{1}{2} \end{array}$ | $\begin{array}{r} 6\frac{1}{3} \\ 4\frac{1}{6} \end{array}$ | $\begin{array}{r} 5\frac{3}{8} \\ 2\frac{2}{3} \end{array}$ | $\begin{array}{r} 7\frac{3}{10} \\ 3\frac{2}{5} \end{array}$ | $\begin{array}{r} 8\frac{3}{4} \\ 5\frac{2}{3} \end{array}$ | $\begin{array}{r} 5\frac{1}{6} \\ 4\frac{3}{4} \end{array}$ | $\begin{array}{r} 4\frac{1}{3} \\ 2\frac{7}{6} \end{array}$ | $\begin{array}{r} 9\frac{7}{5} \\ 5\frac{2}{3} \end{array}$ |
| 14. $\begin{array}{r} 5\frac{2}{3} \\ 3\frac{1}{6} \end{array}$ | $\begin{array}{r} 8\frac{1}{4} \\ 6\frac{5}{12} \end{array}$ | $\begin{array}{r} 6\frac{3}{16} \\ 4\frac{5}{8} \end{array}$ | $\begin{array}{r} 4\frac{2}{5} \\ 2\frac{3}{4} \end{array}$ | $\begin{array}{r} 5\frac{9}{10} \\ 3\frac{4}{5} \end{array}$ | $\begin{array}{r} 4\frac{1}{3} \\ 2\frac{1}{5} \end{array}$ | $\begin{array}{r} 7\frac{3}{8} \\ 4\frac{5}{6} \end{array}$ | $\begin{array}{r} 6\frac{2}{3} \\ 3\frac{3}{8} \end{array}$ |

Using Fractions in Cooking

Mary likes to help her mother can fruit. One day her mother asked Mary to figure out how much sugar and fruit she should use in canning.

1. At first they canned 20 quarts of peaches. At $\frac{1}{4}$ pound of sugar for 1 quart, how much sugar did they need?

2. In making marmalade, they used $2\frac{1}{4}$ cups of sugar for each orange. How much sugar was used for 3 doz oranges?

3. Then they made cranberry conserve with 32 quarts of berries. They needed $1\frac{1}{2}$ pounds of sugar for each quart of berries. How much was required for the conserve?

4. Each fruit jar measured $3\frac{1}{2}$ in. across the bottom. How many feet of shelf space did they need for 60 jars, placed in two rows on each shelf?

5. After canning the fruit, they decided to bake some cookies. They wanted four times the amounts called for in the recipe. Find how much they used of each of these items: $\frac{2}{3}$ cup butter, $\frac{1}{2}$ cup brown sugar, $\frac{1}{2}$ cup white sugar, 1 egg, $2\frac{1}{2}$ cups flour, 1 teaspoon soda, $\frac{1}{4}$ teaspoon cloven, 1 teaspoon cinnamon, $\frac{1}{3}$ cup nut meats.

6. A few days later they decided to bake some more cookies, using only a double recipe this time. How much of each item given in problem 5 did they use?

7. Mary's mother said that her recipe for brown bread called for $\frac{1}{4}$ cup butter, $\frac{1}{4}$ cup sugar, $\frac{2}{3}$ cup molasses, 1 egg, $1\frac{1}{2}$ cups corn meal, $\frac{1}{2}$ cup white flour, 2 cups graham flour, $\frac{1}{2}$ teaspoon salt, 1 teaspoon baking powder, 1 teaspoon soda, and 2 cups milk. Since this would make twice what she wanted, how much of each item should she use?

Unit 12. Division of Fractions

Dividing a Fraction by a Whole Number

1. Tom shares $\frac{1}{2}$ of a small pie equally with Frank. What part of the pie does each boy receive?

You have learned that to divide by 2 is the same as multiplying by $\frac{1}{2}$. The drawing shows that $\frac{1}{2} \div 2 = \frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$.



2. Changing 4, or $\frac{4}{1}$, to $\frac{1}{4}$ is called **inverting** 4. Invert these numbers: 6, 8, $\frac{7}{1}$, $\frac{2}{3}$, $\frac{4}{5}$, $\frac{3}{1}$, $\frac{1}{3}$.

3. Study the steps in the examples below:

$$\frac{2}{3} \div 4 = \frac{2}{3} \times \frac{1}{4} = \frac{2}{12} = \frac{1}{6}$$

$$\frac{5}{6} \div 4 = \frac{5}{6} \times \frac{1}{4} = \frac{5}{24}$$

4. May divided $\frac{3}{4}$ yd. of cloth equally with her sister. What part of a yard did each girl receive?

To find the answer, divide $\frac{3}{4}$ by 2. The drawing shows that $\frac{3}{4} \div 2 = \frac{3}{4} \times \frac{1}{2} = \frac{3}{8}$.



To divide a fraction by a whole number, invert the divisor and multiply.

Divide. Cancel when possible.

5. $\frac{2}{3} \div 2$ $\frac{2}{3} \div 3$ $\frac{1}{2} \div 6$ $\frac{3}{4} \div 3$ $\frac{1}{5} \div 2$

6. $\frac{3}{8} \div 2$ $\frac{1}{2} \div 4$ $\frac{3}{4} \div 5$ $\frac{1}{6} \div 4$ $\frac{2}{3} \div 6$

7. $\frac{1}{6} \div 2$ $\frac{1}{2} \div 8$ $\frac{3}{8} \div 4$ $\frac{3}{4} \div 8$ $\frac{1}{3} \div 4$

8. $\frac{2}{3} \div 8$ $\frac{7}{8} \div 3$ $\frac{1}{3} \div 2$ $\frac{1}{2} \div 5$ $\frac{3}{4} \div 6$

9. $\frac{5}{6} \div 3$ $\frac{1}{3} \div 3$ $\frac{3}{4} \div 2$ $\frac{2}{5} \div 5$ $\frac{5}{6} \div 4$

10. $\frac{3}{5} \div 2$ $\frac{5}{8} \div 3$ $\frac{4}{5} \div 6$ $\frac{1}{6} \div 8$ $\frac{1}{4} \div 4$

Add, Subtract, Multiply, or Divide?

Write A, S, M, or D for each step. Work the problems.

1. Ralph and 3 friends divided half a cake equally among themselves. What fraction of a whole cake did each get?

2. A jar holding $\frac{3}{4}$ of a quart is $\frac{2}{3}$ full of milk. How much milk does it contain?

3. Jane bought $1\frac{1}{2}$ yd. of ribbon for a sash and $\frac{3}{4}$ yd. for her hair. What did she pay for these at 64¢ a yard?

4. A box is 2 feet long, 18 inches ($1\frac{1}{2}$ ft.) wide, and 9 inches ($\frac{3}{4}$ ft.) deep. How many cubic feet does it hold?

5. Mary and Jane had $\frac{3}{4}$ yd. of silk which they wanted to divide equally. What fraction of a yard did each get?

6. Mrs. Brown paid 48¢ a pound for a $13\frac{1}{2}$ -lb. turkey. What did it cost her?

7. John bought 120 papers at $2\frac{1}{4}$ cents and sold them at 3 cents. How much did he gain?

8. A grocer sold $2\frac{1}{2}$ dozen apples at 3¢ apiece. How much did he get for the apples?

9. A room is $13\frac{1}{2}$ feet by $10\frac{1}{2}$ feet. How many feet of molding are needed for the room?

10. Mrs. Franklin sold 8 dozen eggs to her customers at 30¢ a dozen and 14 dozen to a store for \$3. How much did she receive in all?

11. A farm 50 rd. by 120 rd. equals how many acres?

12. A farmer used $\frac{1}{2}$ ton of lime an acre for fertilizing a $9\frac{1}{2}$ -acre patch. How much did he use in all?

13. Sarah used $\frac{7}{8}$ yd. of narrow ribbon to make 3 bows. What fraction of a yard did she have for each bow?

14. John had 12 pencils and sold 8 of them to Tom. What fraction of a dozen did John sell?

Dividing a Whole Number by a Fraction

1. Jack went to the store to get a dollar bill changed into quarters. How many quarters should he receive?

Divide 1 by $\frac{1}{4}$. Think $1 \div \frac{1}{4} = 1 \times \frac{4}{1} = 4$.

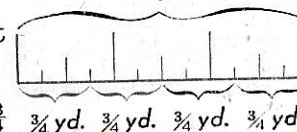
2. How many quarters should Jack get for 3 dollars?

Think $3 \div \frac{1}{4} = 3 \times \frac{4}{1} = 12$. Changing the divisor, $\frac{1}{4}$, to 4 is called **inverting the divisor**. Proof: $12 \times \frac{1}{4} = 3$.

To divide by a fraction, invert the divisor and multiply.

3. How many towels $\frac{3}{4}$ yd. long can be cut from 3 yd. of toweling?

Divide 3 by $\frac{3}{4}$. The drawing at the right shows that $3 \div \frac{3}{4} = 4$.



The easiest way to divide 3 by $\frac{3}{4}$ is to invert the divisor, $\frac{3}{4}$, and multiply by $\frac{4}{3}$, as shown.

$$3 \div \frac{3}{4} = 3 \times \frac{4}{3} = 4$$

Proof: $4 \times \frac{3}{4} = 3$

To prove, multiply the quotient, 4, by the divisor, $\frac{3}{4}$. The result should equal the dividend, 3.

Divide. Prove your division.

4. $6 \div \frac{2}{3}$	$4 \div \frac{2}{3}$	$5 \div \frac{3}{8}$	$7 \div \frac{1}{2}$	$3 \div \frac{1}{6}$
5. $2 \div \frac{4}{5}$	$1 \div \frac{1}{3}$	$2 \div \frac{5}{8}$	$6 \div \frac{3}{10}$	$3 \div \frac{1}{8}$
6. $5 \div \frac{1}{4}$	$3 \div \frac{5}{6}$	$2 \div \frac{2}{5}$	$3 \div \frac{2}{3}$	$2 \div \frac{7}{8}$
7. $8 \div \frac{3}{4}$	$6 \div \frac{7}{8}$	$4 \div \frac{3}{4}$	$14 \div \frac{7}{10}$	$6 \div \frac{2}{7}$
8. $7 \div \frac{1}{5}$	$5 \div \frac{5}{6}$	$4 \div \frac{2}{9}$	$9 \div \frac{2}{3}$	$7 \div \frac{5}{6}$
9. $4 \div \frac{3}{10}$	$8 \div \frac{5}{6}$	$6 \div \frac{8}{9}$	$5 \div \frac{2}{3}$	$4 \div \frac{9}{10}$

Using Fractional Parts of a Dollar

In finding costs, you may often shorten the work by changing the price to a fraction of a dollar. Practice until you can write from memory the fractional parts of a dollar given below:

$10¢ = \$\frac{1}{10}$	$12\frac{1}{2}¢ = \$\frac{1}{8}$	$8\frac{1}{3}¢ = \$\frac{1}{12}$
$25¢ = \$\frac{1}{4}$	$37\frac{1}{2}¢ = \$\frac{3}{8}$	$16\frac{2}{3}¢ = \$\frac{1}{3}$
$50¢ = \$\frac{1}{2}$	$62\frac{1}{2}¢ = \$\frac{5}{8}$	$33\frac{1}{3}¢ = \$\frac{1}{3}$
$75¢ = \$\frac{3}{4}$	$87\frac{1}{2}¢ = \$\frac{7}{8}$	$66\frac{2}{3}¢ = \$\frac{2}{3}$

1. At $16\frac{2}{3}¢$ per can, what is the cost of 24 cans of peaches? (Change $16\frac{2}{3}¢$ to $¢\frac{1}{6}$. $24 \times \$\frac{1}{6} = \$4$.)

2. At $33\frac{1}{3}¢$ per hour, how much will Paul earn in 12 hours?

3. Find the cost of the following: 960 lb. at $8\frac{1}{3}¢$, 96 lb. at $12\frac{1}{2}¢$, 240 lb. at $25¢$, and 420 lb. at $16\frac{2}{3}¢$.

4. Total each bill below. Use fractions of \$1.
 9 yd. gingham @ $33\frac{1}{3}¢$ 90 yd. voile @ $20¢$
 36 yd. ribbon @ $16\frac{2}{3}¢$ 75 yd. silk @ $66\frac{2}{3}¢$
 48 yd. lace @ $8\frac{1}{3}¢$ 72 yd. cambric @ $16\frac{2}{3}¢$
 64 yd. linen @ $50¢$ 56 yd. cotton @ $12\frac{1}{2}¢$

Find the products of the following:

- | | | | |
|--------------------------------|----------------------------|----------------------------|----------------------------|
| 5. $64 \times 75¢$ | $72 \times 8\frac{1}{3}¢$ | $24 \times 37\frac{1}{2}¢$ | $60 \times 33\frac{1}{3}¢$ |
| 6. $96 \times 50¢$ | $42 \times 25¢$ | $80 \times 62\frac{1}{2}¢$ | $90 \times 66\frac{2}{3}¢$ |
| 7. $54 \times 16\frac{2}{3}¢$ | $35 \times 40¢$ | $56 \times 87\frac{1}{2}¢$ | $24 \times 12\frac{1}{2}¢$ |
| 8. $75 \times 20¢$ | $72 \times 33\frac{1}{3}¢$ | $96 \times 12\frac{1}{2}¢$ | $50 \times 25¢$ |
| 9. $36 \times 75¢$ | $84 \times 16\frac{2}{3}¢$ | $60 \times 8\frac{1}{3}¢$ | $26 \times 10¢$ |
| 10. $27 \times 66\frac{2}{3}¢$ | $51 \times 33\frac{1}{3}¢$ | $64 \times 37\frac{1}{2}¢$ | $36 \times 16\frac{2}{3}¢$ |
| 11. $48 \times 37\frac{1}{2}¢$ | $63 \times 66\frac{2}{3}¢$ | $88 \times 12\frac{1}{2}¢$ | $68 \times 25¢$ |

Dividing a Fraction by a Fraction

1. If Ruth cuts $\frac{3}{4}$ of a pie into eighths of a pie, how many pieces will she have?

Divide $\frac{3}{4}$ by $\frac{1}{8}$. From the drawing you can see that $\frac{1}{4} \div \frac{1}{8} = 2$. Then $\frac{3}{4} \div \frac{1}{8} = 6$.

To divide $\frac{3}{4}$ by $\frac{1}{8}$, invert the divisor, $\frac{1}{8}$, and then multiply $\frac{3}{4}$ by $\frac{8}{1}$.

The work is shortened by canceling 2 from 8 and 4.

Ruth will have 6 pieces. Proof: The product of the divisor, $\frac{1}{8}$, multiplied by the quotient, 6, equals the dividend, $\frac{3}{4}$.

$$\frac{3}{4} \div \frac{1}{8} = \frac{3}{4} \times \frac{8}{1} = 6$$

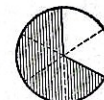
Proof: $\frac{1}{8} \times 6 = \frac{3}{4}$



To divide a fraction or a whole number by a fraction or a whole number, invert the divisor and multiply.

2. Draw a circle to show each of these:

$$\frac{1}{2} \div \frac{1}{6} = 4 \quad \frac{1}{2} \div \frac{1}{6} = \frac{1}{2} \times \frac{6}{1} = 3$$



Divide the following. To prove, multiply the divisor by the quotient.

- | | | | | |
|-----------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|
| 3. $\frac{1}{2} \div \frac{1}{4}$ | $\frac{1}{3} \div \frac{1}{6}$ | $\frac{1}{4} \div \frac{1}{8}$ | $\frac{1}{2} \div \frac{1}{6}$ | $\frac{1}{3} \div \frac{1}{8}$ |
| 4. $\frac{5}{8} \div \frac{2}{3}$ | $\frac{1}{4} \div \frac{1}{2}$ | $\frac{1}{4} \div \frac{1}{6}$ | $\frac{1}{3} \div \frac{1}{4}$ | $\frac{1}{2} \div \frac{2}{5}$ |
| 5. $\frac{2}{3} \div \frac{1}{2}$ | $\frac{3}{4} \div \frac{3}{8}$ | $\frac{1}{2} \div \frac{1}{8}$ | $\frac{5}{6} \div \frac{3}{4}$ | $\frac{2}{3} \div \frac{1}{3}$ |
| 6. $\frac{1}{3} \div \frac{3}{4}$ | $\frac{1}{2} \div \frac{3}{4}$ | $\frac{2}{3} \div \frac{3}{8}$ | $\frac{1}{4} \div \frac{3}{4}$ | $\frac{1}{2} \div \frac{5}{8}$ |
| 7. $\frac{1}{2} \div \frac{1}{3}$ | $\frac{1}{4} \div \frac{3}{5}$ | $\frac{2}{3} \div \frac{1}{6}$ | $\frac{3}{4} \div \frac{1}{2}$ | $\frac{1}{3} \div \frac{1}{8}$ |
| 8. $\frac{5}{8} \div \frac{5}{6}$ | $\frac{3}{4} \div \frac{2}{3}$ | $\frac{1}{6} \div \frac{1}{8}$ | $\frac{1}{3} \div \frac{1}{2}$ | $\frac{2}{3} \div \frac{3}{4}$ |
| 9. $\frac{1}{4} \div \frac{4}{5}$ | $\frac{2}{3} \div 2$ | $\frac{3}{4} \div \frac{3}{5}$ | $4 \div \frac{5}{6}$ | $\frac{3}{4} \div \frac{5}{6}$ |
| 10. $\frac{5}{6} \div 6$ | $\frac{7}{8} \div 5$ | $\frac{5}{6} \div 3$ | $2 \div \frac{3}{4}$ | $6 \div \frac{7}{8}$ |

Problems

Write A, S, M, or D for each step. Work the problems.

1. What did Mrs. Smith pay for a case of 36 cans of corn at $8\frac{1}{3}\text{¢}$ per can?
2. A newsboy paid $\frac{3}{4}\text{¢}$ for each paper. How many papers could he get for \$1.50?
3. At \$23.45 per thousand feet, how much will 9000 feet of lumber cost?
4. In building a 36 yd. fence around his rabbit yard, Tom drove a stake in the ground every $\frac{2}{3}$ of a yard. How many stakes did he need?
5. John weighed $88\frac{3}{4}$ pounds in January and 92½ pounds the following October. How much did he gain?
6. Mr. Jones made a payment of \$450 on a car costing \$1170. How much was due each month if he paid the balance in 9 equal monthly installments?
7. Mrs. Green bought $\frac{1}{2}$ bu. of apples. If she uses $\frac{2}{3}$ of them, what fraction of a bushel will she have left?
8. There are 36 children enrolled in the sixth grade, but last week 8 of them were absent because of sickness. What fraction of the pupils were absent?
9. Mother divided $\frac{2}{3}$ of a small cake equally among 6 boys. What fraction of a cake did each receive?
10. If mother had divided $\frac{2}{3}$ of a cake equally among 4 boys, what fraction of a cake would each have received?
11. Mary lives $\frac{3}{8}$ of a mile from school, and John lives $\frac{1}{4}$ mile farther away. How far does John live from school?
12. At an average rate of $2\frac{1}{2}$ miles a minute, how far will an airplane fly in 1 hour?
13. What is the cost of $1\frac{2}{3}$ yd. of silk at \$1.12½ a yard?

Third Self-Test

Test in Fractions

Multiply the following:

$$\begin{array}{l} 1. \quad \frac{7\frac{1}{2}}{2} \quad \frac{4\frac{1}{4}}{3} \quad \frac{8\frac{3}{4}}{2} \quad \frac{4\frac{2}{5}}{3} \quad \frac{5\frac{5}{6}}{4} \quad \frac{8\frac{5}{8}}{6} \quad \frac{7\frac{2}{3}}{5} \end{array}$$

$$2. \quad \frac{14}{3\frac{1}{2}} \quad \frac{11}{2\frac{2}{3}} \quad \frac{6}{3\frac{7}{8}} \quad \frac{17}{4\frac{1}{2}} \quad \frac{16}{1\frac{2}{5}} \quad \frac{7}{4\frac{5}{6}} \quad \frac{12}{6\frac{3}{8}}$$

$$3. \quad \frac{21}{4\frac{1}{2}} \quad \frac{9}{3\frac{5}{6}} \quad \frac{13}{5\frac{2}{3}} \quad \frac{8}{2\frac{3}{5}} \quad \frac{16\frac{5}{8}}{4} \quad \frac{12\frac{3}{4}}{7} \quad \frac{16\frac{2}{3}}{8}$$

$$4. \quad \frac{1}{3} \times \frac{2}{5} \quad \frac{2}{3} \times \frac{5}{6} \quad \frac{1}{3} \times \frac{7}{8} \quad \frac{1}{2} \times \frac{5}{8} \quad \frac{3}{4} \times \frac{2}{3}$$

$$5. \quad \frac{1}{3} \times \frac{2}{3} \quad \frac{3}{4} \times \frac{7}{12} \quad \frac{4}{5} \times \frac{2}{3} \quad \frac{3}{4} \times \frac{3}{5} \quad \frac{2}{3} \times \frac{7}{8}$$

$$6. \quad \frac{1}{4} \times 1\frac{1}{2} \quad \frac{5}{6} \times 2\frac{2}{3} \quad \frac{1}{2} \times 2\frac{2}{3} \quad 1\frac{3}{4} \times \frac{3}{4} \quad 5\frac{1}{2} \times \frac{2}{3}$$

$$7. \quad \frac{7}{8} \times 21 \quad \frac{3}{4} \times 13 \quad 16 \times \frac{7}{12} \quad 24 \times \frac{5}{8} \quad 14 \times \frac{4}{5}$$

Divide the following:

$$8. \quad \frac{7}{8} \div \frac{2}{3} \quad 5 \div \frac{5}{8} \quad \frac{3}{4} \div \frac{5}{6} \quad \frac{1}{2} \div \frac{1}{4} \quad 7 \div \frac{3}{4}$$

$$9. \quad \frac{8}{9} \div \frac{2}{3} \quad \frac{1}{2} \div \frac{5}{6} \quad \frac{4}{5} \div \frac{3}{4} \quad 6 \div \frac{2}{3} \quad \frac{3}{4} \div \frac{2}{3}$$

$$10. \quad \frac{4}{5} \div 4 \quad \frac{5}{6} \div 2 \quad \frac{7}{8} \div 6 \quad \frac{3}{4} \div 5 \quad \frac{1}{2} \div 3$$

$$11. \quad 5 \div \frac{5}{8} \quad \frac{3}{8} \div 4 \quad 4 \div \frac{3}{8} \quad 5 \div \frac{2}{3} \quad \frac{3}{8} \div 2$$

12. Add each number in row A to each number in B.

A	$9\frac{1}{2}$	$6\frac{1}{3}$	$7\frac{2}{5}$	$8\frac{1}{6}$	$7\frac{3}{4}$	$6\frac{3}{8}$
B	$2\frac{1}{8}$	$4\frac{3}{4}$	$3\frac{5}{6}$	$2\frac{5}{8}$	$1\frac{1}{2}$	$2\frac{2}{3}$

13. Subtract each number in row B from each number in row A.

Problem Test

1. At $2\frac{3}{4}$ cents per mile, what will railroad fare cost for 4 people for a 60-mile trip?
2. What is the area of a rug 9 ft. 3 in. by 13 ft. 8 in.?
3. How many half-pints equal 18 quarts?
4. A box is 16 inches long, 10 inches wide, and 6 inches deep. How many cubic feet does it hold?
5. How many acres are there in a field 108 by 80 rd.?
6. A motorboat traveled 95 miles in 6 hours. What was its average speed per hour?
7. If it takes $1\frac{3}{4}$ bushels of wheat to seed 1 acre, how many bushels will it take to seed 80 acres?
8. A grocer divided a 72-pound tub of butter into $\frac{1}{4}$ -pound bricks. How many bricks did he get?
9. John had $\frac{3}{4}$ pound of candy and gave $\frac{1}{2}$ of it to his sister. What fraction of a pound did she get?
10. Mrs. Jones bought 20 lb. of sugar at $6\frac{1}{2}\text{¢}$ a pound, a basket of grapes for 45¢, and $2\frac{1}{4}$ doz. jelly glasses at 25¢ a dozen. What was the cost of her jelly?
11. How much would Grace have left from 2 dollars after buying 3 yd. of cambric at $16\frac{2}{3}\text{¢}$ a yard?
12. How far did John walk in an hour if he walked $\frac{3}{4}$ of a mile in 15 minutes?
13. What was John's average distance in feet per minute in problem 12?
14. Mrs. Brown bought 2 doz. bananas, but 2 bananas were green. What fraction of the 2 dozen were green?
15. Mrs. Robbins had $3\frac{3}{8}$ yd. of material and used $1\frac{1}{4}$ yd. to make an apron. How many yards did she have left?

Unit 13. Division of Fractions

Division with Mixed Numbers

1. If a school uses $3\frac{3}{4}$ T. of coal per day, how long will 25 T. of coal last?

Divide 25 by $3\frac{3}{4}$.
Change $3\frac{3}{4}$ to $\frac{15}{4}$. Invert $\frac{4}{15}$ and multiply

$$25 \div 3\frac{3}{4} = 25 \times \frac{4}{15} = \frac{20}{3} = 6\frac{2}{3}$$

as shown. The answer is $6\frac{2}{3}$ days. Proof: $3\frac{3}{4} \times 6\frac{2}{3} = 25$.

2. Harry walked $5\frac{1}{2}$ miles in 2 hours. What was his average speed per hour?

Change $5\frac{1}{2}$ to $\frac{11}{2}$, invert the divisor, and multiply

$$5\frac{1}{2} \div 2 = \frac{11}{2} \times \frac{1}{2} = \frac{11}{4} = 2\frac{3}{4}$$

as shown. The answer is $2\frac{3}{4}$ mi. Proof: $2 \times 2\frac{3}{4} = 5\frac{1}{2}$.

Divide the following and prove:

- | | | | | |
|------------------------------------|--------------------------------|--------------------------------|--------------------------------|----------------------------------|
| 3. $2\frac{1}{2} \div 3$ | $3\frac{1}{3} \div 4$ | $2\frac{1}{4} \div 5$ | $3\frac{5}{6} \div 2$ | $2\frac{5}{6} \div 1\frac{2}{5}$ |
| 4. $4\frac{1}{8} \div 3$ | $4\frac{1}{6} \div 5$ | $4\frac{7}{8} \div 9$ | $4\frac{1}{2} \div 4$ | $1\frac{1}{8} \div 12$ |
| 5. $4\frac{3}{5} \div 3$ | $5\frac{5}{8} \div 6$ | $3\frac{3}{4} \div 9$ | $2\frac{4}{5} \div 3$ | $4\frac{2}{3} \div 5$ |
| 6. $16 \div 1\frac{1}{2}$ | $9 \div 2\frac{1}{4}$ | $8 \div 3\frac{1}{6}$ | $9 \div 3\frac{1}{2}$ | $8 \div 2\frac{2}{3}$ |
| 7. $16 \div 4\frac{4}{5}$ | $6 \div 2\frac{1}{2}$ | $35 \div 2\frac{1}{3}$ | $11 \div 6\frac{7}{8}$ | $10 \div 3\frac{1}{3}$ |
| 8. $5 \div 2\frac{2}{3}$ | $28 \div 5\frac{5}{8}$ | $9 \div 3\frac{1}{8}$ | $10 \div 1\frac{1}{2}$ | $12 \div 2\frac{1}{4}$ |
| 9. $7 \div 2\frac{1}{2}$ | $2 \div 3\frac{1}{3}$ | $19 \div 4\frac{3}{4}$ | $13 \div 4\frac{7}{8}$ | $15 \div 4\frac{1}{6}$ |
| 10. $8 \div \frac{2}{3}$ | $3\frac{3}{4} \div 5$ | $4 \div 6\frac{2}{3}$ | $2\frac{5}{7} \div 7$ | $12\frac{4}{5} \div 8$ |
| 11. $\frac{5}{6} \div \frac{2}{3}$ | $\frac{7}{8} \div \frac{1}{2}$ | $\frac{1}{4} \div \frac{1}{8}$ | $\frac{3}{8} \div \frac{3}{4}$ | $18 \div 2\frac{1}{4}$ |
| 12. $\frac{3}{4} \div \frac{3}{4}$ | $\frac{4}{5} \div \frac{3}{4}$ | $\frac{1}{6} \div \frac{2}{3}$ | $\frac{4}{5} \div \frac{2}{3}$ | $3 \div 5\frac{1}{5}$ |
| 13. $3\frac{1}{2} \div 6$ | $2\frac{1}{5} \div 2$ | $3\frac{3}{8} \div 6$ | $11 \div 3\frac{3}{4}$ | $\frac{5}{8} \div 3$ |

Problems with Fractions

Write A, S, M, or D for each step. Work the problems.

1. A man whose salary is \$2400 a year saved $\frac{1}{4}$ of it. How much did he save?
2. A lot is $33\frac{1}{2}$ feet wide. How long must it be to contain 4500 sq. ft.?
3. A room has 36 pupils, of whom 20 are boys. The number of girls is what fraction of the number of pupils?
4. If $\frac{3}{8}$ yd. of gingham is used for one collar, how many collars will 6 yd. of material make?
5. Mrs. Robbins bought $3\frac{3}{4}$ yd. of material to make aprons at $1\frac{1}{4}$ yd. each. How many could she make?
6. From a vinegar barrel holding $31\frac{1}{2}$ gallons, a grocer sold $2\frac{1}{2}$ and $3\frac{1}{4}$ gallons. How much did he have left?
7. On a 3-day automobile trip Mr. Smith went 236 mi., 308 mi., and 180 mi. What was his average run?
8. John lives $\frac{1}{4}$ mile from school. One day he walked $\frac{1}{2}$ of the way and ran the rest. How many yards did he run?
9. At an average speed of 66 miles per hour, how long will it take a streamlined train to run 561 miles?
10. Mr. Robbins tested his new car by driving it 30 miles in $\frac{2}{3}$ of an hour. At this rate, how many miles per hour did he drive?
11. It took Mr. Brown 15 days to do $\frac{3}{4}$ of his plowing. At this rate, how long did it take him to finish plowing?
12. The school ball team played 16 games and lost 6 of them. What fraction of their games did they win?
13. Mary had $3\frac{1}{2}$ yards of ribbon from which she wanted to cut pieces 6 inches long. How many pieces did she get? (What fraction of a yard is 6 inches?)

Division with Mixed Numbers.

1. At a speed of $2\frac{1}{2}$ miles per hour, how long will it take a boy scout troop to hike $8\frac{1}{4}$ miles?

Divide $8\frac{1}{4}$ by $2\frac{1}{2}$.
Change $8\frac{1}{4}$ and $2\frac{1}{2}$ to improper fractions, invert the divisor, and multiply. The answer is $3\frac{3}{10}$ hr.

$$8\frac{1}{4} \div 2\frac{1}{2} = \frac{33}{4} \times \frac{2}{5} = \frac{33}{10} = 3\frac{3}{10}$$

2. Study the division in each of the following examples. Copy them and do the work with closed book.

$$10 \div \frac{5}{6} = 10 \times \frac{6}{5} = 12$$

$$6\frac{3}{4} \div \frac{3}{4} = \frac{27}{4} \times \frac{4}{3} = 9$$

$$8\frac{1}{4} \div 10\frac{3}{8} = \frac{9}{4} \times \frac{8}{27} = \frac{2}{3}$$

$$2\frac{2}{3} \div 1\frac{1}{4} = \frac{8}{3} \times \frac{4}{5} = \frac{32}{15} = 2\frac{2}{15}$$

3. Change these mixed numbers to improper fractions:

$$8\frac{1}{2} \quad 4\frac{5}{8} \quad 3\frac{5}{6} \quad 6\frac{2}{3} \quad 4\frac{5}{8} \quad 16\frac{2}{3} \quad 7\frac{3}{8} \quad 4\frac{6}{7} \quad 3\frac{7}{12}$$

Divide the following:

4. $1\frac{1}{3} \div 3\frac{1}{2}$	$8\frac{1}{4} \div 4\frac{1}{8}$	$2\frac{3}{4} \div 4\frac{1}{2}$	$3\frac{1}{2} \div 4\frac{1}{2}$	$7\frac{1}{2} \div 1\frac{3}{4}$
5. $1\frac{1}{4} \div 2\frac{2}{3}$	$7\frac{1}{3} \div 2\frac{1}{4}$	$6\frac{1}{4} \div 4\frac{1}{2}$	$5\frac{1}{2} \div 2\frac{1}{6}$	$6\frac{1}{2} \div 5\frac{1}{3}$
6. $4\frac{5}{8} \div 3\frac{1}{3}$	$9\frac{1}{4} \div 6\frac{7}{8}$	$2\frac{2}{3} \div 1\frac{3}{8}$	$5\frac{2}{3} \div 1\frac{3}{4}$	$9\frac{1}{4} \div 3\frac{1}{4}$
7. $5\frac{1}{3} \div 2\frac{1}{2}$	$3\frac{1}{3} \div 4\frac{1}{2}$	$7\frac{1}{4} \div 3\frac{1}{6}$	$4\frac{1}{3} \div 2\frac{1}{3}$	$6\frac{3}{4} \div 9\frac{3}{8}$
8. $4\frac{1}{4} \div 1\frac{1}{4}$	$2\frac{2}{3} \div 1\frac{1}{3}$	$6\frac{1}{4} \div 3\frac{3}{8}$	$9\frac{3}{4} \div 3\frac{1}{4}$	$3\frac{1}{4} \div 1\frac{3}{4}$
9. $\frac{4}{5} \div 1\frac{3}{5}$	$\frac{5}{6} \div 2\frac{1}{2}$	$\frac{3}{8} \div 3\frac{1}{3}$	$\frac{2}{3} \div 1\frac{1}{8}$	$\frac{1}{4} \div 2\frac{5}{6}$
10. $\frac{1}{2} \div 4\frac{3}{8}$	$\frac{1}{4} \div 6\frac{1}{3}$	$\frac{1}{3} \div 2\frac{2}{5}$	$\frac{1}{3} \div 3\frac{1}{3}$	$\frac{2}{3} \div 1\frac{7}{8}$
11. $3\frac{1}{6} \div \frac{1}{4}$	$5\frac{1}{3} \div \frac{5}{6}$	$2\frac{1}{4} \div \frac{2}{5}$	$4\frac{3}{4} \div \frac{1}{8}$	$2\frac{1}{2} \div \frac{2}{3}$
12. $5\frac{2}{3} \div \frac{1}{5}$	$6\frac{1}{2} \div \frac{1}{5}$	$2\frac{3}{8} \div \frac{1}{2}$	$3\frac{3}{4} \div \frac{3}{4}$	$5\frac{1}{4} \div \frac{4}{5}$
13. $7\frac{1}{2} \div \frac{7}{8}$	$5\frac{2}{3} \div \frac{2}{5}$	$4\frac{1}{4} \div \frac{3}{8}$	$5\frac{1}{3} \div \frac{2}{3}$	$4\frac{1}{6} \div \frac{1}{2}$

Add, Subtract, Multiply, or Divide?

Write A, S, M, or D for each step. Work the problems.

1. Our class had 42 yd. of goods. After 14 girls used $\frac{3}{4}$ yd. each to make sleeves, how many yards were left?

2. What is the area of a rectangle $9\frac{5}{8}$ in. by 16 in.?

3. A farmer sold 16 baskets of peaches with 9 peaches in each basket. How many dozen peaches did he sell?

4. If a boiler in a large building uses $2\frac{3}{4}$ tons of coal per day, how long will 55 tons of coal last?

5. What did a dealer pay for the following groceries: 75 lb. of coffee at $33\frac{1}{3}\text{¢}$, 132 lb. of cookies at $12\frac{1}{2}\text{¢}$, 80 lb. of butter at 25¢ , and 125 lb. of lard at $8\frac{1}{3}\text{¢}$?

6. Mrs. Smith's recipe for butterscotch sauce calls for $1\frac{1}{4}$ cups brown sugar, $\frac{2}{3}$ cup corn sirup, 4 tablespoons butter, $\frac{3}{8}$ cup cream, and $\frac{3}{8}$ cup milk. How much will each item be if she uses $1\frac{1}{2}$ times as much as is called for?

7. In a relay race $\frac{3}{4}$ of a mile was covered by 6 runners. What part of a mile did each one run?

8. Find $\frac{1}{2}$ of each item in this recipe for muffins: 1 tablespoon butter, $\frac{1}{2}$ c. milk, $\frac{1}{2}$ teaspoon salt, $\frac{2}{3}$ c. sugar, 2 eggs, $\frac{1}{2}$ yeast cake, 3 tablespoons water, and $2\frac{1}{2}$ c. flour.

9. What is the volume of a tank that is 25 feet long, 10 feet wide, and $4\frac{1}{2}$ feet deep?

10. Find the cost of $3\frac{1}{8}$ yd. of ribbon at 38¢ a yard.

11. A grocer put 85 bu. of potatoes in $\frac{1}{2}$ -bu. baskets. How much did he get for them at 75¢ a basket?

12. Mary helped her uncle pack candy in his shop. She put 10 lb. of chocolates in $\frac{1}{2}$ -lb. boxes, 15 lb. of bonbons in $\frac{1}{4}$ -lb. boxes, and 21 lb. of hard candy in $\frac{3}{4}$ -lb. boxes. How many boxes did she pack?

Mixed Practice

Add the following:

1. $4\frac{1}{2}$	$5\frac{2}{3}$	$7\frac{1}{2}$	$6\frac{5}{8}$	$8\frac{5}{6}$	$4\frac{2}{3}$	$8\frac{3}{16}$
$3\frac{1}{8}$	$3\frac{1}{2}$	$3\frac{3}{5}$	$2\frac{3}{4}$	$5\frac{2}{3}$	$3\frac{3}{4}$	$4\frac{7}{8}$
2. $2\frac{1}{8}$	$3\frac{4}{5}$	$4\frac{5}{6}$	$3\frac{2}{3}$	$2\frac{4}{5}$	$6\frac{7}{8}$	$6\frac{5}{12}$
$3\frac{1}{8}$	$2\frac{2}{3}$	$4\frac{3}{4}$	$5\frac{4}{9}$	$1\frac{3}{4}$	$4\frac{3}{8}$	$5\frac{3}{4}$

Subtract the following:

3. $9\frac{1}{2}$	$7\frac{1}{2}$	$8\frac{2}{3}$	$7\frac{3}{8}$	$6\frac{1}{6}$	7	$6\frac{1}{4}$
$3\frac{1}{4}$	$4\frac{3}{4}$	$5\frac{3}{4}$	$2\frac{1}{4}$	$4\frac{7}{8}$	$5\frac{5}{8}$	$3\frac{1}{2}$
4. $4\frac{1}{2}$	$8\frac{1}{2}$	$7\frac{5}{12}$	$5\frac{1}{4}$	$8\frac{1}{6}$	$4\frac{4}{5}$	$5\frac{1}{2}$
$2\frac{7}{8}$	$5\frac{1}{3}$	$4\frac{3}{4}$	$2\frac{3}{16}$	$4\frac{2}{3}$	$2\frac{1}{2}$	$3\frac{3}{5}$

Find the answers for the following. Watch the signs.

5. $7\frac{3}{4}$	$15\frac{2}{3}$	$6\frac{5}{6}$	$7\frac{5}{8}$	$8\frac{1}{3}$	$5\frac{5}{6}$	$4\frac{5}{8}$
$\times 4$	$\times 9$	$\times 6$	$\times 8$	$\times 5$	$\times 4$	$\times 3$
6. 36	18	14	16	10	15	11
$\times 3\frac{5}{6}$	$\times 2\frac{2}{3}$	$\times 3\frac{3}{4}$	$\times 4\frac{3}{8}$	$\times 2\frac{2}{3}$	$\times 4\frac{1}{2}$	$\times 2\frac{3}{8}$
7. $\frac{3}{4} \div \frac{1}{8}$	$\frac{7}{8} \div \frac{3}{4}$	$\frac{2}{3} \div \frac{5}{6}$	$\frac{3}{4} \div \frac{2}{3}$	$\frac{2}{3} \div \frac{2}{5}$		
8. $\frac{2}{3} \div \frac{2}{3}$	$\frac{3}{4} \div \frac{5}{6}$	$\frac{3}{5} \div \frac{3}{4}$	$\frac{7}{8} \div \frac{1}{3}$	$\frac{5}{6} \div \frac{2}{3}$		
9. $6 \div \frac{5}{8}$	$9 \div \frac{3}{4}$	$12 \div \frac{2}{3}$	$10 \div \frac{7}{8}$	$3\frac{2}{3} \div \frac{2}{3}$		
10. $\frac{2}{3} \div 1\frac{5}{6}$	$5\frac{1}{2} \div \frac{1}{3}$	$6\frac{7}{8} \div \frac{5}{6}$	$2\frac{1}{3} \div 3\frac{1}{4}$	$4\frac{1}{5} \div 1\frac{1}{3}$		
11. $\frac{3}{4} + \frac{2}{3}$	$\frac{3}{4} - \frac{2}{3}$	$\frac{3}{4} \times \frac{2}{3}$	$\frac{3}{4} \div \frac{2}{3}$	$\frac{2}{3} \div \frac{3}{4}$		
12. $3\frac{1}{3} + \frac{3}{4}$	$3\frac{1}{3} - \frac{3}{4}$	$3\frac{1}{3} \times \frac{3}{4}$	$3\frac{1}{3} \div \frac{3}{4}$	$\frac{3}{4} \div 3\frac{1}{3}$		
13. $4\frac{1}{2} \times 1\frac{2}{3}$	$4\frac{1}{2} - 1\frac{2}{3}$	$5 - 2\frac{7}{8}$	$4\frac{1}{6} \div \frac{5}{8}$	$6\frac{9}{10} + 4\frac{4}{5}$		

Prices at the Store

When you purchase several items at a store, the clerk finds the cost of each item and then adds these costs to find the total amount you are to pay. If you buy 4 oranges at 28¢ a dozen, the exact price would be 9 $\frac{1}{3}$ ¢, but you would have to pay 10¢, because retail stores count any fraction of a cent in the cost as 1¢.

1. Find the cost of the following grocery order: 9 pounds of coffee at 27 $\frac{1}{2}$ ¢ a pound, 3 $\frac{1}{4}$ pounds of cheese at 30¢ a pound, 3 $\frac{1}{2}$ dozen eggs at 22¢ a dozen, 2 $\frac{1}{4}$ pounds of steak at 32¢ a pound, $\frac{3}{4}$ dozen grapefruit at \$1 a dozen, 19 pounds of sugar at 6 $\frac{1}{2}$ ¢ a pound, $\frac{3}{4}$ pound of candy at 50¢ a pound.

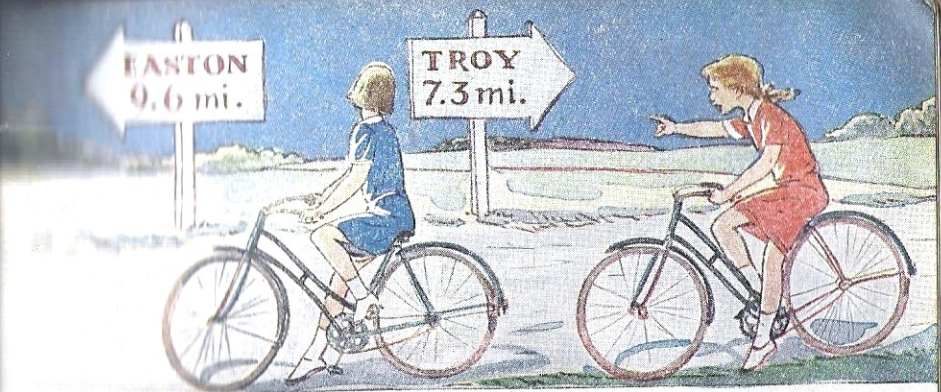
2. Find the total of this hardware bill: 50 feet of garden hose at 4 $\frac{1}{2}$ ¢ a foot, 3 $\frac{1}{2}$ dozen hinges at 35¢ a dozen, 6 feet of iron pipe at 10¢ a foot, 6 pounds of nails at 12 $\frac{1}{2}$ ¢ a pound, 3 pints of paint at 62¢ a pint, 12 yardsticks at 8 $\frac{1}{2}$ ¢ each, 2 dozen bolts at 39¢ a dozen.

3. Find the total of this fruit order: $\frac{1}{4}$ dozen lemons at 25¢ a dozen, 4 pounds of pears at 6¢ a pound, 2 $\frac{1}{2}$ dozen oranges at 30¢ a dozen, 3 watermelons at 48¢ apiece, 4 boxes of strawberries at 12 $\frac{1}{2}$ ¢ a box, 7 $\frac{1}{2}$ pounds of apples at 4¢ a pound, 3 pounds of apricots at 14¢ a pound.

Multiplication of Fractions

Multiply:

- | | | | | |
|-------------------------------------|-----------------------------------|------------------------------------|------------------------------------|------------------------------------|
| 1. $\frac{7}{8} \times 21$ | $\frac{4}{5} \times 14$ | $\frac{3}{8} \times 25$ | $\frac{5}{6} \times 48$ | $\frac{2}{3} \times 20$ |
| 2. $\frac{2}{3} \times \frac{5}{6}$ | $2\frac{1}{2} \times \frac{3}{4}$ | $4\frac{2}{5} \times 8\frac{3}{4}$ | $3\frac{2}{3} \times 4\frac{1}{2}$ | $1\frac{1}{8} \times 1\frac{1}{4}$ |
| 3. $\frac{3}{4} \times \frac{1}{3}$ | $\frac{1}{6} \times \frac{3}{8}$ | $1\frac{1}{2} \times \frac{3}{5}$ | $\frac{2}{3} \times \frac{3}{8}$ | $1\frac{1}{6} \times 4\frac{1}{4}$ |
| 4. $20 \times \frac{1}{6}$ | $72 \times 1\frac{1}{12}$ | $44 \times \frac{3}{8}$ | $85 \times 1\frac{3}{5}$ | $49 \times \frac{1}{4}$ |



Unit 14. The Meaning of Decimal Fractions

Two Ways of Writing Fractions

1. Mary and Jane were on the road from Troy to Easton. Mary said, "That sign says we have come 73 miles, and we have 96 miles to go. It must be wrong."

Jane said, "We have come 7 and 3 tenths miles, and we have 9 and 6 tenths miles to go. That sign is right."

Jane knew that 7.3 means 7 $\frac{3}{10}$. We call .3 and .6 decimal fractions, or decimals.

A decimal is a short way of writing a common fraction like $\frac{3}{10}$, without writing the denominator.

2. Write these common fractions as decimal fractions:

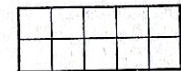
$\frac{9}{10}$ $\frac{7}{10}$ $\frac{9}{10}$ $\frac{6}{10}$ $\frac{4}{10}$ $\frac{2}{10}$ $\frac{8}{10}$ $\frac{3}{10}$

A combination of a whole number and a decimal, such as 7.3 or 9.6, is sometimes called a **mixed decimal**.

3. Change the following to mixed decimals:

$4\frac{7}{10}$ $8\frac{4}{10}$ $12\frac{2}{10}$ $10\frac{7}{10}$ $42\frac{3}{10}$ $14\frac{9}{10}$ $8\frac{5}{10}$

4. Draw a rectangle 5 in. by 2 in. and divide it into tenths. The figure at the right shows that $\frac{1}{2} = \frac{5}{10} = .5$. $\frac{1}{5} = \frac{2}{10} = .2$.



5. Change each of these fractions to a decimal:

$\frac{1}{10}$ $\frac{1}{5}$ $\frac{2}{5}$ $\frac{3}{5}$ $\frac{4}{5}$ $\frac{3}{10}$ $\frac{7}{10}$ $\frac{9}{10}$ $\frac{1}{2}$ $4\frac{1}{2}$

Problems without Numbers

Write A, S, M, or D for each step in these problems.

1. When you know your bank balance on the first of the month, the amount you have deposited, and the amount you have drawn out during the month, how do you find your bank balance at the end of the month?

2. John knows the yearly income of his father. How does he find the average income per month?

3. The members of a golf club know the number of members and the amount of the membership fee paid by each. How do they find the total amount of fees paid?

4. Mary knows the distance her father drove his automobile and the number of hours he drove. How can she find his average speed per hour?

5. A carpenter knows how many hours he has worked for Mr. Brown and his wages per hour. How does he find the amount he should charge for his work?

6. Mr. Brown knows the carpenter's wages per hour. When he gets the carpenter's bill, how can he find the number of hours worked?

7. If you know the number of pupils enrolled in your school and the number present, how can you find the number absent?

8. When you know the area and the length of a rectangle, how do you find its width?

9. When you know the weight of a load of oats in pounds, what else must you know to find the number of bushels in the load? How do you find the value of the oats?

10. Tom had a wagon in which he wanted to carry sand. He knew the width and the length of the wagon and also its depth. How did he find the volume?

Two-Place Decimals, or Hundredths

When you write dollars and cents, separated by a decimal point, you write the cents as a decimal.

Study each of the following statements:

1¢ = \$.01 = .01 (read $\frac{1}{100}$) of one dollar.

15¢ = \$.15 = .15 (read $\frac{15}{100}$) of one dollar.

10¢ = \$.10 = .10 (read $\frac{10}{100}$) = .1 of one dollar.

125¢ = \$1.25 = 1.25 (read $1\frac{25}{100}$) of one dollar.

The name of a one-place decimal is tenths. The name of a two-place decimal is hundredths.

Change these fractions to decimals:

1. $\frac{75}{100}$ $\frac{5}{100}$ $\frac{16}{100}$ $\frac{20}{100}$ $\frac{9}{100}$ $7\frac{45}{100}$ $5\frac{7}{100}$

2. $\frac{30}{100}$ $\frac{80}{100}$ $\frac{70}{100}$ $\frac{10}{100}$ $\frac{90}{100}$ $4\frac{60}{100}$ $2\frac{35}{100}$

Write the following as decimals:

3. 1 tenth; 5 and 28 hundredths; 79 and 27 hundredths.

4. 17 hundredths; 12 and 7 hundredths; 5 and 1 tenth.

5. $\frac{7}{10}$ in. $\frac{43}{100}$ in. $\frac{75}{100}$ ft. $\frac{45}{100}$ mi. $\frac{9}{10}$ hr.

Write the decimals below as common fractions.

6. .6 = $\frac{6}{10}$ = $\frac{3}{5}$.25 = $\frac{25}{100}$ = $\frac{1}{4}$.20 = $\frac{20}{100}$ = $\frac{1}{5}$

7. .2 .4 .3 .8 .5 .50 .75

8. .10 .70 .40 .60 .80 .05 .35

9. .45 .55 .65 .85 .95 .12 .16

10. .24 .48 .36 .64 .18 .96 .15

Change the following fractions to decimals.

Example: $\frac{1}{2}$ = $\frac{5}{10}$ = .5.

11. $\frac{1}{2}$ $\frac{1}{4}$ $\frac{1}{5}$ $\frac{1}{10}$ $\frac{3}{4}$ $\frac{2}{5}$ $2\frac{1}{2}$ $3\frac{2}{5}$

12. $\frac{3}{5}$ $\frac{4}{5}$ $\frac{3}{10}$ $\frac{9}{10}$ $\frac{7}{10}$ $3\frac{1}{4}$ $1\frac{7}{10}$ $6\frac{4}{5}$

Add, Subtract, Multiply, or Divide?

Write A, S, M, or D for each step. Work the problems.

1. Mary's sewing class made 16 aprons using $\frac{3}{4}$ yd. of gingham for each apron. How many yards were used in all?

2. Mr. Wilson bought an automobile for \$875. He paid \$475 in cash and the remainder in 8 equal monthly installments. How much did he pay each month?

3. A man's income was \$2400. He spent $\frac{1}{5}$ for rent and $\frac{2}{3}$ for other purposes. How much did he have left?

4. How many acres are there in a wood lot 80 rods long and 64 rods wide?

5. How many bushels of wheat can be put in a wheat bin 20 ft. by 8 ft. by 6 ft.? (1 bu. of wheat = $1\frac{1}{4}$ cu. ft.)

6. What is the area of a floor $12\frac{1}{2}$ ft. by 10 ft.?

7. Fred weighs $72\frac{1}{4}$ pounds, and John weighs 77 pounds. What is the difference in their weights? Write the fraction in the answer as a decimal.

8. At $16\frac{1}{2}$ ¢ per gallon, what do 10 gal. gasoline cost?

9. Mrs. Ray bought $\frac{3}{8}$ yd. of ribbon at 32¢ a yard and $6\frac{1}{2}$ yd. of silk at \$3 a yard. What was the total cost?

10. A football team played 12 games and won 9. Write as a decimal the part of the games which they won ($\frac{9}{12}$ equals what decimal?)

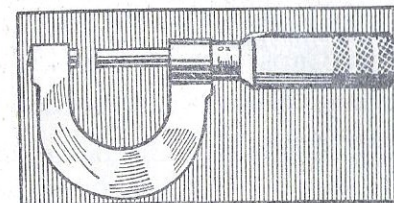
11. A grocer bought 7 baskets of peaches for \$5.60 and sold them at \$1.20 a basket. What was his gain?

12. Virginia gained $1\frac{1}{8}$ inches in height in 9 months. What was her average gain per month?

13. Fred raised four pumpkins which weighed $24\frac{3}{8}$ lb., $21\frac{1}{4}$ lb., $16\frac{1}{2}$ lb., and $22\frac{1}{8}$ lb. What was the average weight of these pumpkins?

Three-Place Decimals, or Thousandths

The micrometer shown at the right will make measurements as fine as $\frac{1}{1000}$ of an inch. With such a tool, you can measure the thickness of a sheet of steel, a sheet of paper, a thread, or a hair.



A sheet of paper in this book is about $\frac{3}{1000}$ inch thick. As a decimal $\frac{3}{1000}$ is written .003, read 3 thousandths.

Read the numbers below:

1. $\frac{1}{10} = .1$ $\frac{1}{100} = .01$ $\frac{1}{1000} = .001$, read 1 thousandth.

2. $\frac{2}{1000} = .002$ $\frac{16}{1000} = .016$ $\frac{125}{1000} = .125$ $\frac{500}{1000} = .500$

The name of a three-place decimal is thousandths.

Write the fractions below as decimals:

3. $\frac{7}{1000}$ $\frac{15}{1000}$ $\frac{10}{1000}$ $\frac{83}{1000}$ $\frac{35}{1000}$ $\frac{135}{1000}$ $\frac{975}{1000}$
 4. $\frac{9}{10}$ $\frac{5}{100}$ $\frac{5}{1000}$ $37\frac{5}{10}$ $3\frac{75}{100}$ $\frac{375}{1000}$ $3\frac{75}{1000}$

Be ready to write the decimals below from dictation:

5. .06 .25 2.09 3.75 .675 .064 .005
 6. 7.6 .02 64.3 85.04 3.3 .33 .033
 7. 5.625 8.105 7.075 4.004 3.520 .500

It is quicker to read such numbers as 458.075 like this: "four five eight point oh seven five."

Read the following in two ways:

8. 4387.875 3.076 608.090 547.84 249.007

9. 638.06 25.600 5007.451 210.011 4306.43

10. Tell which of these decimals is larger: .2 or .15
 .5 or .50 .1 or .02 .48 or .475 .45 or .5

Sight Problems

Write the answer to each problem.

1. Caps that cost \$12 a dozen were sold for \$1.50 apiece. What was the gain on each cap?
2. If a half-pound box of candy costs 40¢, what will a $1\frac{1}{2}$ -pound box cost at the same rate?
3. What is the perimeter of a room 20 ft. by 14 ft.?
4. Mr. Schmidt had \$100 in the bank. He deposited \$300 and later withdrew \$250. What was his balance?
5. At 40¢ a dozen, what is the cost of 3 oranges?
6. I have $\frac{2}{3}$ of a dozen spoons. How many more spoons do I need to make a dozen?
7. If 3 apples cost 15 cents, what will 7 apples cost?
8. At \$23.40 per thousand feet, how much will 5000 feet of lumber cost?
9. The owner of a farm receives $\frac{1}{3}$ of the income from the sale of grain, and the tenant receives the rest. What does the tenant get from an income of \$3900?
10. Mrs. Jones bought 3 lb. of coffee at $33\frac{1}{3}$ ¢ per pound, and 2 lb. of rice at $8\frac{1}{3}$ ¢ per pound. What was her bill?
11. John's arithmetic scores on two tests were $8\frac{1}{2}$ and $9\frac{1}{2}$. What was the average of these two scores?
12. A pair of \$5 shoes was sold at a reduction of $\frac{1}{4}$. What was the selling price?
13. At $33\frac{1}{3}$ ¢ a pound, what is the cost of $1\frac{1}{2}$ lb. of meat?
14. How many aprons can be made from 14 yd. of percale when $1\frac{3}{4}$ yd. are used to make 1 apron?
15. Mr. Buck bought a radio for \$120. He paid \$40 in cash. How much was each of his 5 equal monthly payments?

Unit 15. Some Uses for Decimals

Place Names of Integers and Decimals

1. Copy the table of place names.

2. Begin with units' place and memorize the seven place names for integers.

3. Begin with the decimal point and memorize the six place names for decimals. Write them from memory.

7 millions	6 hundred-thousands	5 ten-thousands	4 thousands	3 hundreds	2 tens	1 units	.	1 tenths	2 hundredths	3 thousandths	4 ten-thousandths	5 hundred-thousandths	6 millionths
Integers								Decimals					

4. How do the place names for decimals differ in spelling from the place names for integers?

As a rule, more than three decimal places are not used. However, for accurate measurements, four, five, and six decimal places are necessary.

A four-place decimal is read ten-thousandths. A five-place decimal is read hundred-thousandths. A six-place decimal is read millionths.

Read the fractions and decimals below:

6. $\frac{6275}{10000} = .6275$, read 6275 ten-thousandths.
6. $\frac{15}{100000} = .00015$, read 15 hundred-thousandths.
7. $\frac{647506}{1000000} = .647506$, read 647,506 millionths.
8. 6.001 4.0001 3.00025 .000425 7.015
9. 4.075 5.0625 2.57394 .038401 6.805

Problem Practice

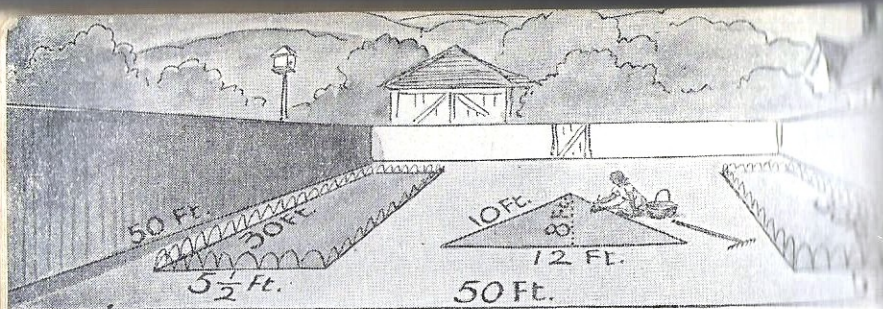
Write A, S, M, or D for each step. Work the problems.

1. A farmer used $1\frac{7}{8}$ bushels of seed wheat per acre. At \$1.20 a bushel, how much will seed cost for 56 acres?
2. A bricklayer worked 36 hours at \$1.25 an hour and 7 hours overtime at \$1.65 an hour. How much did he earn?
3. How many square feet are there in a rectangle 4 feet 3 inches by 6 feet 8 inches?
4. At \$2 a square yard, what is the cost of a walk 3 ft. wide and 30 ft. long?
5. Find the volume of a box 5 ft. by 2 ft. by 1 ft.
6. At $2\frac{1}{4}$ cu. yd. per load, how many loads will be required to remove 72 cu. yd. of dirt?
7. A concrete walk is 5 ft. wide, 30 ft. long, and 4 in. thick. How many cubic feet of concrete are there?
8. Ed had \$40 and spent \$30 for a bicycle. What fractional part of his money did he spend?
9. How many feet did Mary walk per minute if she walked $\frac{4}{5}$ of a mile in 16 minutes?
10. John paid 70¢ for $3\frac{1}{2}$ dozen oranges. What was the price per dozen?
11. Charlotte's mother bought $4\frac{1}{3}$ yd. of tapestry to cover some chairs and $5\frac{1}{3}$ yd. for a pair of curtains. At \$2.25 a yard, how much did she pay for the tapestry?
12. How many yards of toweling will you need for $2\frac{1}{2}$ dozen guest towels, using 18 inches for each?
13. Jane bought $4\frac{1}{2}$ yd. of cloth on sale at 72¢. The usual price was 30¢ a yard. What did she save?
14. How long will it take a train to go 180 miles at an average speed of 45 miles per hour?

Some Common Uses for Decimals

Read each statement. Express each decimal below as a fraction. Find other uses of decimals in your reading.

1. Robert rode his bicycle 14.7 mi. on Saturday.
2. Tom bought 13 gal. of gasoline at 18.9¢ a gallon.
3. In one year the rainfall at Boston was 47.38 in.
4. A city lot measured 180.8 ft. by 59.5 ft.
5. Two sheets of steel measured .009 in. and .012 in.
6. At 1 o'clock, the temperature was 96.2 degrees.
7. In English money, the standard pound equals \$4.8066 (4 and 8665 ten-thousandths dollars).
8. The length of 1 meter is 39.37 inches.
9. A liter = 1.0567 qt. A gram = 0.0353 oz.
10. A degree of longitude at the equator equals 69.17 miles.
11. The Panama Canal is 50.72 mi. long, and the Suez Canal is 104.50 mi. long.
12. A basketball team won 18 games and lost 6 games of 24 games played. The team's standing was .750.
13. In 1939 John R. Cobb drove his racing auto .621 mi. in 6.05 sec., an average speed of 369.7 mi. per hour.
14. The total length of the Fort Peck Dam is 20,000 feet, or 3.8 miles.
15. In 1939 the Bluebird II, a racing boat, ran 2 miles at an average speed of 141.74 mi. per hour.
16. In 1934 a fast train ran 61.4 mi. in 39 min. 46 sec., an average speed of 92.62 mi. per hour.
17. The maximum speed for a plane in 1939 over a course 1.864 miles long was 469.22 mi. per hour.



Area and Perimeter of Triangles

Jane was preparing the soil for three flower beds.

1. One of these beds was in the shape of a triangle, the base of which was 12 ft. and the height 8 ft. What was the area of this bed in square yards?

The drawing shows that the area of the triangle equals one-half the area of a rectangle 12 ft. by 8 ft. Since the area of the rectangle = 12×8 , the area of the triangle = $12 \times 8 \times \frac{1}{2} = 48$ sq. ft. = $5\frac{1}{3}$ sq. yd.



The area of a triangle equals one-half the product of its base and its altitude. The perimeter of a triangle is the sum of its three sides.

2. There were also two long flower beds in the shape of rectangles, each 30 ft. long and $5\frac{1}{2}$ ft. wide. What was the total area of all three flower beds in square yards?

3. The space for the lawn, with the flower beds, was 50 feet square. How many square yards were left for grass?

4. After planting the seeds, Jane placed a wire fence around each bed. How many yards of wire fencing did she need for the triangular bed if two sides of the triangle were each 10 ft. long and the third side was 12 ft.?

5. How many yards of fencing did Jane need for the two rectangular beds?

Practice with Decimals

Change each of the following decimals to a common fraction in its lowest terms:

1. .5 .50 .6 .8 .25 .60 .75
 2. .20 .30 .40 .80 .15 .36 .28
 3. .125 .250 .375 .500 .625 .875 .025

Change each of the fractions below to a decimal:

4. $\frac{1}{5}$ $\frac{1}{5}$ $\frac{2}{5}$ $\frac{3}{5}$ $\frac{4}{5}$ $\frac{1}{4}$ $\frac{3}{4}$ $\frac{7}{10}$ $\frac{9}{10}$
 5. $\frac{1}{10}$ $\frac{3}{10}$ $1\frac{4}{5}$ $2\frac{1}{4}$ $4\frac{1}{2}$ $6\frac{2}{10}$ $9\frac{3}{4}$ $5\frac{1}{5}$
 6. $\frac{6}{100}$ $\frac{43}{100}$ $5\frac{3}{100}$ $6\frac{85}{100}$ $12\frac{675}{1000}$ $9\frac{64}{1000}$
 7. $\frac{7}{10000}$ $\frac{25}{10000}$ $\frac{435}{10000}$ $\frac{2509}{10000}$ $5\frac{4565}{10000}$

8. Tell which is larger: .1 or .05 .8 or .75
 1.5 or 2.65 1.025 or 1.15 .275 or .3 .40 or .6

Arrange the numbers in each row below according to value, beginning with the largest number.

9. 3.750 .375 375 37.5 3750 .035
 10. .8 .08 800 .008 80 8000
 11. 2.5 1.875 3.1 1.0273 2.65 2.499

Read the following decimals:

12. 9.3 5.07 6.005 4.6805 7.00325
 13. .07 8.76 3.765 9.0015 2.01109
 14. .30 .667 2.089 7.4652 .000075
 15. .01 .001 1.0001 .00001 .000001

Write the numbers below in figures:

16. Three thousand and seven hundredths.
 17. Two hundred six and forty-five thousandths.
 18. Sixty-five and two hundred six ten-thousandths.
 19. Fifty-one and seven hundred five millionths.

Mixed Practice

Find the answers. Watch the signs.

1.	717	580	652	749	365	847
	581	463	860	276	194	668
	547	425	385	355	100	700
	850	190	146	645	854	473
	365	787	647	582	748	965
	<u>794</u>	<u>955</u>	<u>558</u>	<u>419</u>	<u>635</u>	<u>740</u>

2.	\$1.75	\$6.25	\$2.85	\$3.96	\$7.94
	2.15	5.50	0.50	1.84	8.20
	0.47	1.35	7.84	6.67	5.78
	8.59	2.64	9.58	3.43	.75
	3.68	1.79	6.80	8.74	4.07
	<u>1.75</u>	<u>4.46</u>	<u>3.49</u>	<u>7.12</u>	<u>4.09</u>

3.	\$17.50	\$25.00	\$7.84	\$2.87	\$7.45
	<u>-8.34</u>	<u>-21.46</u>	<u>-4.95</u>	<u>-1.49</u>	<u>-5.90</u>

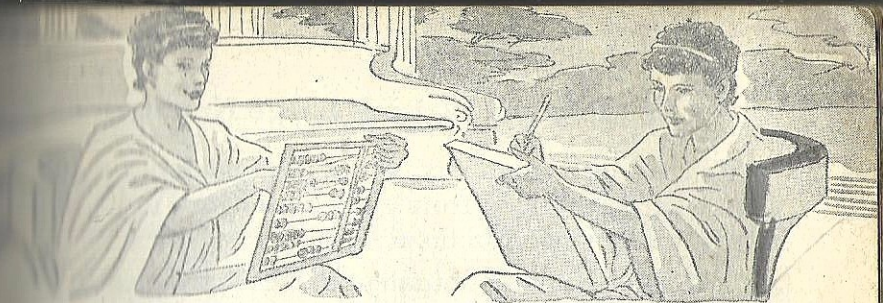
4.	\$15.00	\$10.00	\$8.60	\$8.06	\$9.48
	<u>-11.86</u>	<u>-8.85</u>	<u>-4.95</u>	<u>-5.74</u>	<u>-8.69</u>

5.	647	509	710	834	517	946
	<u>×52</u>	<u>×64</u>	<u>×57</u>	<u>×65</u>	<u>×85</u>	<u>×97</u>

6.	728	871	528	650	796	857
	<u>×124</u>	<u>×92</u>	<u>×206</u>	<u>×470</u>	<u>×520</u>	<u>×427</u>

7. Divide each number in row A by each number in row B.

A	9180	4132	7065	5941	80175
B	27	84	69	93	75



Unit 16. Large Numbers

Arabic and Roman Numerals

The figures that we use in writing numbers are called Hindu-Arabic, or Arabic, numerals because they were first used in India about 2000 years ago and later brought to Europe by the Arabs.

Our number and money systems are both called decimal systems because the value of a figure in one place in the number is ten times the value that same figure would have in the next lower place.

For example, in the number 444, the first 4 means 400, the second, 40 and the third, 4. The value of any figure depends upon its place in the number.

The Roman system is clumsy because its numerals do not have place value. In the numbers V, VI, VII, and VIII, V has a different place in each number, and yet its value is the same. Notice how much easier it is to multiply 444 by 7 than CDXLIV by VII.

1. Give the different values of 7 in 749; 479; and 497; of 0 in 648,578; 56,283; 8640; 967; and 14.6.

2. Arrange these numbers in the order of their value:

740 497 947 479 974 794

3. Arrange the figures in 5369.2 to give the greatest possible value; the least possible value.

Reading and Writing Large Numbers

To read large numbers, you must remember that the names of the periods from right to left are units, thousands, millions, and billions.

1. Read the large number in the statement: "On June 30, 1940, the public debt of the United States was \$42967531037."

Begin at the right and point off the number into periods of three figures, naming the periods from right to left.

Then begin at the left and read "42 billion, 967 million, 531 thousand, 37 dollars."

Read the numbers in the following sentences:

2. For 1940 the receipts of our government were \$5,924,836,402, and the expenditures were \$9,666,085,589.

3. The total stock of money in the United States on June 30, 1940, was \$28,457,959,138, of which only \$7,847,500,588 was in circulation.

4. The total land area of the 48 states of the Union is 1,903,216,640 acres. Of this total, 986,771,016 acres are included in 6,288,648 farms.

5. The 1940 populations of the largest cities in the world were as follows:

Greater London	8,655,000	Greater Paris	4,933,866
New York	7,454,995	Greater Berlin	4,332,242
Greater Tokyo	7,001,650	Moscow	4,137,918

Write the following numbers, point them off into periods, and read them:

6.	924319352	5802126	51212	1599497006
7.	878798325	6046691	90560	1801287606
8.	286542198	2494477	133546	8125741900
9.	407212538	9569790	16164	1000000000

Sight Problems

Write the answer to each problem.

- At \$4 per dozen, what do $1\frac{1}{4}$ doz. photographs cost?
- If carfare is 7¢, and you can buy 4 tickets for 25¢, how much can you save on 4 rides by buying tickets?
- Clara needs $\frac{3}{4}$ of a dozen buttons for one dress. How many dozen buttons will she need for 4 dresses?
- If $\frac{3}{8}$ lb. of sugar is used for canning 1 qt. of blackberries, how many pounds are used for 48 qt.?
- If $\frac{1}{2}$ pound of sugar is used in canning one quart of strawberries, how many pounds are used for 50 quarts?
- When motor oil sells for 60¢ a gallon, what is the price per quart?
- At 50¢ an hour, what will a man earn in $7\frac{1}{2}$ hr.?
- At 40¢ per dozen, what do $3\frac{1}{4}$ doz. oranges cost?
- Frank bought 10 pounds of sugar at $6\frac{1}{2}$ ¢ per pound. What was his change from \$1?
- A boy picked 80 boxes of cherries and received for pay $\frac{1}{4}$ of what he picked. He sold his share at 15¢ per box. How much money did he receive?
- When pencils sell at 2 for 5¢, what do a dozen cost?
- A man paid \$6000 for a house and lot. Of this amount $\frac{1}{5}$ was paid for the lot. What did the house cost?
- If the fare between two cities is \$2.80, what is the cost of 2 full fares and 1 half fare?
- Ray and his father built 9 rods of fence in 4 hours. How many rods per hour did they build?
- John had 25 marbles and lost 15 of them. What decimal shows the part of his marbles which he still had?

Large Numbers as Round Numbers

When exact figures are not needed, large numbers are often changed to **round numbers**, correct to the nearest hundred, thousand, million, or billion, by dropping figures at the right and using 0's to fill the places. Round numbers are easier to remember than exact numbers.

84,345	84,000
70,964	71,000
36,516	37,000

In rounding off a number, when the first figure dropped is 5 or more, add 1 to the figure before it, when less than 5, do not add 1.

1. Write as round numbers correct to the nearest thousand: 25,284, 65,730, 174,812, 245,430

2. Write as round numbers correct to the nearest hundred thousand: 6,457,328, 9,862,678, 1,207,647

3. Write as round numbers correct to the nearest million: 12,842,604, 4,437,560, 8,655,124

4. Write as round numbers correct to the nearest billion: \$5,635,856,408, \$15,425,839,700, \$1,232,456,370

5. Read the following figures on world production of automobiles. Then round off the numbers, correct to the nearest million:

1929: 6,294,682	1932: 1,976,963	1935: 5,127,517
1930: 4,125,650	1933: 2,675,547	1936: 5,790,503
1931: 3,042,007	1934: 3,735,841	1937: 6,352,000

6. Read the figures giving the expenditures of the United States government. Round them off to the nearest thousand.

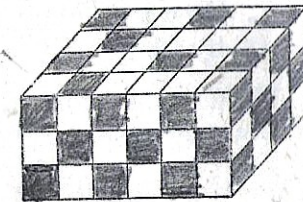
1880: \$267,642,958	1920: \$6,482,090,191
1900: \$520,860,847	1940: \$9,666,085,500

Measuring Volume or Capacity

1. How many cubic inches are there in a stack of 1-inch blocks 4 in. by 4 in. by 3 in.?

2. How many blocks are there in the bottom layer at the right?

3. How many 1-inch cubes could you put in a box 12 in. long, 12 in. high, and 12 in. wide?



4. How many cubic inches are there in 1 cu. ft.?

5. Make a drawing to represent a stack of 1-foot blocks 3 ft. long, 3 ft. high, and 3 ft. wide. How many cubic feet does the drawing represent?

6. How many cubic feet are there in 1 cu. yd.?

7. How many cubic feet are there in a schoolroom 34 ft. long, 12 ft. high, and 27 ft. wide?

8. How many cubic yards of sand can be put in a box 8 ft. long, 6 ft. wide, and 4 ft. deep?

9. How many cubic inches are there in twelve gallons? (1 cu. in. = 1 gallon)

10. If a fish tank is 33 in. long, 14 in. wide, and 11 inches deep, inside measurement, how many gallons of water will it hold when full?

11. A truck filled with coal was 8 ft. long, 6 ft. wide, and 5 ft. deep. Allowing 75 lb. to a cubic foot, what was the weight of this coal?

12. If a water tank is 12 ft. long, 3 ft. wide, and 4 ft. deep, how many gallons of water will it hold? (1 cu. ft. = $\frac{7}{8}$ gallons)

13. How many cubic yards are there in an excavation 67 ft. by 27 ft. by 9 ft.?

Problem Practice

1. How many cubic yards are there in an excavation 36 ft. by 21 ft. by 9 ft.?

Give the formula, $V = \frac{lwh}{27}$, in your own words.

$$\frac{36 \times 21 \times 9}{27} = 252$$

2. How many cubic feet of air are there in a hall 40 ft. by 26 ft. by $10\frac{1}{2}$ ft.?

3. How many cords are there in a pile of wood 6 feet wide, 12 feet long, and 8 feet high? (128 cu. ft. = 1 cord.)

4. Find the area in square feet of a rectangle 36 feet by 72 feet.

5. A milkman had 18 quarts of cream which he wanted to sell in $\frac{1}{2}$ -pint bottles. How many bottles did he need?

6. Turn to a calendar and find out how many days there are in the first 3 months of this year.

7. At 9¢ a quart, what does 1 gal. 3 qt. of milk cost?

8. Find the number of cords of wood in a pile 10 feet wide, 18 feet long, and 6 feet high.

9. How many square yards of carpet are needed to cover a floor $14\frac{2}{3}$ feet wide and 15 feet long? Give the answer as a mixed number.

10. How many cubic feet of coal will a bin hold if it is 10 feet wide, 20 feet long, and 8 feet deep?

11. On January 1 Robert's savings account amounted to \$118.42. Between January 1 and July 1 he deposited \$14.87, and on July 1 the bank added \$1.18 interest. After he had withdrawn \$10, what was his balance?

12. In 28 working days Mr. Jones earns \$126. How much does he earn per day?

Fourth Self-Test

Test in Fractions

Divide:

1. $\frac{1}{8} \div \frac{4}{5}$	$\frac{1}{8} \div \frac{3}{8}$	$\frac{3}{5} \div \frac{4}{5}$	$\frac{5}{6} \div \frac{5}{12}$	$\frac{2}{3} \div \frac{2}{5}$
2. $\frac{1}{2} \div \frac{3}{5}$	$\frac{3}{4} \div \frac{1}{8}$	$\frac{3}{5} \div \frac{2}{3}$	$\frac{5}{8} \div \frac{5}{6}$	$\frac{4}{5} \div \frac{3}{5}$
3. $\frac{1}{8} \div \frac{2}{3}$	$\frac{5}{8} \div \frac{3}{5}$	$\frac{1}{3} \div \frac{3}{4}$	$\frac{3}{4} \div \frac{3}{8}$	$\frac{2}{9} \div \frac{1}{6}$
4. $7\frac{1}{2} \div \frac{3}{8}$	$2\frac{1}{2} \div \frac{1}{2}$	$4\frac{1}{2} \div \frac{3}{5}$	$2\frac{5}{8} \div \frac{1}{4}$	$6\frac{2}{5} \div \frac{4}{5}$
5. $1\frac{1}{2} \div \frac{3}{4}$	$\frac{1}{4} \div 1\frac{1}{2}$	$8\frac{1}{2} \div \frac{5}{6}$	$\frac{5}{8} \div 3\frac{1}{3}$	$4\frac{2}{5} \div 1\frac{1}{10}$

Multiply the following:

6. $\frac{3}{4} \times \frac{2}{3}$	$\frac{6}{7} \times \frac{3}{5}$	$\frac{1}{2} \times \frac{4}{5}$	$\frac{3}{5} \times \frac{1}{3}$	$\frac{1}{4} \times \frac{1}{5}$
7. $24\frac{3}{4} \times \frac{11}{12}$	$32\frac{1}{2} \times \frac{2}{5}$	$3\frac{1}{3} \times \frac{1}{4}$	$18\frac{3}{5} \times \frac{1}{15}$	$17 \times \frac{14\frac{1}{2}}{2\frac{1}{2}}$
8. $\frac{3}{8} \times \frac{3}{4}$	$\frac{1}{3} \times \frac{1}{8}$	$\frac{4}{5} \times \frac{1}{2}$	$\frac{3}{10} \times \frac{1}{3}$	$\frac{3}{4} \times \frac{5}{8}$
9. $\frac{4}{5} \times \frac{1}{3}$	$\frac{3}{5} \times \frac{3}{4}$	$\frac{1}{6} \times \frac{1}{5}$	$\frac{3}{8} \times \frac{3}{5}$	$\frac{5}{6} \times 1\frac{7}{10}$
10. $\frac{3}{5} \times \frac{2}{5}$	$\frac{7}{8} \times \frac{2}{3}$	$\frac{5}{12} \times \frac{3}{5}$	$\frac{9}{16} \times \frac{2}{3}$	$\frac{7}{16} \times 2\frac{1}{2}$
11. $\frac{3}{8} \times \frac{3}{4} \times \frac{2}{3}$	$\frac{3}{4} \times \frac{5}{8} \times \frac{2}{3}$	$\frac{1}{2} \times \frac{1}{3} \times \frac{3}{4}$		
12. $\frac{3}{8} \times \frac{3}{4} \times \frac{1}{2}$	$\frac{5}{8} \times \frac{1}{3} \times \frac{2}{7}$	$\frac{2}{3} \times \frac{3}{4} \times \frac{1}{5}$		

13. Add each fraction in row A to each in row B.

A	$\frac{3}{4}$	$\frac{5}{6}$	$\frac{7}{8}$	$\frac{11}{12}$	$\frac{9}{10}$	$\frac{5}{8}$	$\frac{4}{5}$
B	$\frac{1}{3}$	$\frac{2}{5}$	$\frac{1}{2}$	$\frac{1}{4}$	$\frac{3}{8}$	$\frac{1}{6}$	$\frac{3}{5}$

14. Subtract each fraction in row B from each fraction in row A.

Problem Test

Write A, S, M, or D for each step. Work the problems.

1. A barrel of oil contains 42 gallons. How many barrels can be filled from a tank holding 15,000 gallons? How many gallons will be left over?

2. At 94 cents a bushel, what is the value of a load of wheat weighing 8400 lb.? (1 bu. wheat = 60 lb.)

3. For our school play we sold 120 tickets at \$.25 and 240 at \$.50. How much did we receive from the sale?

4. How many voters were there in a city of 81,600 inhabitants, if $\frac{2}{5}$ of the number voted?

5. Bertha finished 12 of the 16 problems she had to work. What fraction of them did she still have to work?

6. When railroad fare costs $2\frac{1}{2}$ cents per mile, how much will 3 tickets cost for a trip of 280 miles?

7. Three boys weigh $98\frac{1}{2}$ lb., $108\frac{3}{4}$ lb., and $112\frac{1}{4}$ lb. What is the average weight of these boys?

8. At the rate of \$2.50 a square yard, how much will a rug cost for a floor $10\frac{1}{2}$ feet wide and 12 feet long?

9. Find the area of a field 60 rods by 80 rods.

10. How many cubic feet are there in a box 6 feet long, 4 feet wide, and $3\frac{1}{2}$ feet deep?

11. What do 100 lb. of ice cost at \$5.50 per 1000 lb.?

12. What is the cost of 432 ft. of lumber at $12\frac{1}{2}$ ¢ a foot?

13. Using $1\frac{7}{8}$ yards for each dress, how many dresses can I make from a piece of cloth 15 yards long?

14. The area of a field is 4830 square rods, and its width is 56 rods. What is its length?

15. A farmer used $14\frac{3}{4}$ bu. of wheat to seed one field and $12\frac{1}{2}$ bu. for another. How much did he use for both?

Testing What You Have Learned

1. What do you get when you multiply the number of articles by the price of each article?

2. What is the result of multiplying the length of a room by its width?

3. How many feet are there in a mile?

4. What fraction of 15 yd. is 12 yd.?

5. Find $\frac{2}{3}$ of 75. What is $\frac{3}{4}$ of \$45?

6. How many pounds are there in a ton?

7. Cancel: $\frac{12 \times 18}{16} \quad \frac{56 \times 72}{48} \quad \frac{8 \times 39}{18 \times 13} \quad \frac{40 \times 180}{160}$

8. Draw a square which shows that $\frac{1}{2}$ of $\frac{3}{4} = \frac{3}{8}$.

9. At 30¢ a dozen, what will 8 oranges cost?

10. How many cubic inches are there in a cubic foot?

11. What is the name of a two-place decimal? a four-place decimal? a six-place decimal?

12. Write as decimals: $\frac{2}{1000} \quad \frac{5}{100} \quad \frac{125}{10000} \quad \frac{16}{1000}$

13. Write the place names for 4,978,517 and for 407,748.

14. Read: 9.3 3.765 .00001 1.0001 .000475

15. What is the meaning of $V = lwh$? $A = lw$?

16. How many pints are there in a gallon?

Find answers for the following. Watch the signs.

17. $64 \times \frac{7}{8} \quad 4\frac{5}{16} \times 7\frac{1}{2} \quad \frac{3}{8} \times \frac{2}{3} \quad 11\frac{2}{3} \times \frac{7}{9} \quad 76 \times \frac{5}{8}$

18. $\frac{1}{2} \div 6 \quad 2 \div \frac{2}{5} \quad \frac{3}{8} \div \frac{3}{4} \quad 2\frac{2}{3} \div 3\frac{1}{9} \quad 18 \div \frac{2}{3}$

19. $\frac{1}{2} + \frac{1}{16} \quad \frac{3}{4} + 6\frac{1}{2} \quad 5\frac{1}{6} + 6\frac{3}{8} \quad 4\frac{1}{3} + 2\frac{2}{3} \quad 19\frac{3}{5} + 7\frac{1}{10}$

20. $\frac{5}{6} - \frac{1}{2} \quad 5\frac{3}{4} - 2\frac{2}{3} \quad 6\frac{3}{8} - 3\frac{7}{8} \quad 7\frac{5}{6} - 2\frac{2}{3} \quad 13\frac{5}{7} - 4\frac{3}{14}$

Mixed Test

- | | | | |
|--|---|---|---|
| 1. $\begin{array}{r} 8471 \\ \times 456 \\ \hline \end{array}$ | 2. $\begin{array}{r} 923151 \\ -394649 \\ \hline \end{array}$ | 3. $\begin{array}{r} 926647 \\ -277653 \\ \hline \end{array}$ | 4. $\begin{array}{r} 9800 \\ \times 740 \\ \hline \end{array}$ |
| 5. $85 \overline{)39826}$ | 6. $\begin{array}{r} 38956 \\ 973 \\ 94399 \\ 74863 \\ 9586 \\ 24658 \\ \hline \end{array}$ | 7. $\begin{array}{r} 6504 \\ 5078 \\ 777 \\ 88569 \\ 4076 \\ 32436 \\ \hline \end{array}$ | 8. $\begin{array}{r} 540 \\ 6730 \\ 700 \\ 9400 \\ 840 \\ 6507 \\ \hline \end{array}$ |
| 9. $69 \overline{)48921}$ | | | |
| 10. $127 \overline{)54081}$ | | | |
| 11. $6\frac{3}{8} \times 48$ | 12. $13\frac{1}{2} \times 1\frac{1}{3}$ | 13. $7 + 4\frac{1}{2}$ | |
| 14. $1\frac{1}{4} \div 4\frac{1}{6}$ | 15. $8\frac{1}{8} - 6\frac{3}{4}$ | 16. $2\frac{1}{6} - 1\frac{1}{3}$ | |
| 17. $18\frac{2}{3} + 19\frac{3}{4}$ | 18. $3\frac{5}{8} + 8\frac{1}{12}$ | 19. $7\frac{1}{4} + 11\frac{1}{2}$ | |

Test in Problems without Numbers

Write A, S, M, or D for each step.

- If you know the distance a car travels and its speed, how do you find the time?
- If you know a man's salary per month, how do you find his salary for a year?
- If you know the length, width, and depth of a box, how do you find its volume?
- If you know the price of an article and the number bought, how do you find the cost?
- If you know the speed at which a train travels and the time, how do you find the distance?
- A builder knew the length of a city block and the width of each building lot. How could he find the number of lots in this block?
- If you know the price of a gallon of milk, how do you find the price of a pint at the same rate?

Unit 17. Addition and Subtraction of Decimals

Some Uses for Decimals

You know how to add and subtract dollars and cents. It is just as easy to add and subtract other decimals.

1. The Weather Bureau reported a rainfall for five days as follows: 1.72 in., .09 in., 1.20 in., .79 in., 1.06 in. What was the total rainfall for these five days?

1.72
.09
1.20
.79
1.06
<u>4.86</u>

Add these decimals and point off the sum just as you would in adding dollars and cents. The total rainfall for five days was 4.86 in.

2. The speedometer on Fred's bicycle read 478.7 mi. on Monday. A week later it read 519.3 mi. How many miles did he ride his bicycle during the week?

519.3
478.7
<u>40.6</u>

Subtract decimals just as you do whole numbers. Place the decimal points as shown.

3. Watch your signs. Find the answers.

$\begin{array}{r} 7.05 \\ 3.65 \\ .82 \\ 8.15 \\ .78 \\ \hline \end{array}$	$\begin{array}{r} 4.01 \\ 1.50 \\ 2.94 \\ .06 \\ 3.00 \\ \hline \end{array}$	$\begin{array}{r} 3.25 \\ .86 \\ .58 \\ 1.49 \\ 4.07 \\ \hline \end{array}$	$\begin{array}{r} .8 \\ .5 \\ .3 \\ .9 \\ .5 \\ \hline \end{array}$	$\begin{array}{r} 5.6 \\ 3.9 \\ 4.7 \\ 1.8 \\ .9 \\ \hline \end{array}$	$\begin{array}{r} 4.675 \\ 2.803 \\ 7.007 \\ 3.560 \\ .875 \\ \hline \end{array}$
---	--	---	---	---	---

$\begin{array}{r} 3.4 \\ -1.8 \\ \hline \end{array}$	$\begin{array}{r} \$60.40 \\ -19.58 \\ \hline \end{array}$	$\begin{array}{r} 6.07 \\ -1.75 \\ \hline \end{array}$	$\begin{array}{r} 2.063 \\ -1.785 \\ \hline \end{array}$	$\begin{array}{r} 317.18 \\ -69.89 \\ \hline \end{array}$	$\begin{array}{r} .85 \\ -.76 \\ \hline \end{array}$
$\begin{array}{r} 8.5 \\ -7.8 \\ \hline \end{array}$	$\begin{array}{r} \$28.03 \\ -6.98 \\ \hline \end{array}$	$\begin{array}{r} 7.40 \\ -4.04 \\ \hline \end{array}$	$\begin{array}{r} 8.001 \\ -5.075 \\ \hline \end{array}$	$\begin{array}{r} 275.10 \\ -108.16 \\ \hline \end{array}$	$\begin{array}{r} .64 \\ -.08 \\ \hline \end{array}$

Problems Using Decimals

Write the answers.

1. The speedometer on an automobile showed 29,940.9 mi. at the beginning of a trip and 33,002.4 mi. at the end. How many miles had the automobile gone on the trip?

2. The rainfall in a certain city was 3.76 in. for March, .89 in. for April, and 4.09 in. for May. What was the total rainfall for the three months?

3. Mr. Brown drove his car 278.2 mi. on Monday, 76.8 mi. on Tuesday, and 384.2 mi. on Wednesday. How far did he drive in the three days?

4. At one gasoline station the price of gasoline is 19.8¢ per gallon, and at another station the price is 17.8¢. What is the difference in price?

5. On Monday morning the speedometer of a car read 4030.7 mi., and on Tuesday night it read 4301.8 mi. How far had the car been driven in these two days?

6. On July 1, the speedometer on Harry's bicycle read 876.4 mi., and on August 1, it read 1121.0 mi. How many miles did Harry ride in July?

7. Fred made a broad jump of 12.7 ft., and Tom made a jump of 13.2 ft. Tom jumped how much farther than Fred?

8. A lot is 110.6 ft. long and 73.9 ft. wide. Find the perimeter of the lot.

9. A gallon of water weighs 8.355 pounds, and a gallon of milk weighs 8.605 pounds. What is the difference between these weights?

10. The normal temperature of the body is about 98.6°. If a patient's temperature is 101.2, how many degrees of temperature above normal does he have?

Practice with Decimals

Add and check. Watch the decimal points.

1. $\begin{array}{r} .3 \\ .4 \\ .2 \\ \hline 2.04 \\ .7 \\ \hline 9.85 \end{array}$	$\begin{array}{r} .4 \\ .9 \\ .3 \\ \hline 6.004 \\ .38 \\ \hline 3.755 \end{array}$	$\begin{array}{r} .6 \\ .5 \\ .9 \\ \hline 5.75 \\ 3.508 \\ 6.4 \\ \hline 156.58 \end{array}$	$\begin{array}{r} 5.6 \\ 3.7 \\ 1.2 \\ \hline .03 \\ .01 \\ .05 \\ \hline .0043 \\ .6952 \\ .876 \\ \hline 159.5 \end{array}$	$\begin{array}{r} .49 \\ .26 \\ .03 \\ \hline 14.087 \\ 9.1 \\ 3.65 \\ \hline 27.637 \end{array}$	$\begin{array}{r} .93 \\ .62 \\ .47 \\ \hline 14.087 \\ 9.1 \\ 3.65 \\ \hline 27.637 \end{array}$
2. $\begin{array}{r} 5.71 \\ 43. \\ \hline 87.049 \\ 7.9 \\ \hline \end{array}$	$\begin{array}{r} .187 \\ 4.704 \\ .069 \\ 6.38 \\ \hline \end{array}$	$\begin{array}{r} 98. \\ 7.6 \\ 1.238 \\ 128.07 \\ \hline \end{array}$	$\begin{array}{r} 5.614 \\ 82.7 \\ .09 \\ 3.408 \\ \hline \end{array}$	$\begin{array}{r} 2.6 \\ 1.09 \\ 14.873 \\ 7.008 \\ \hline \end{array}$	

4. $7.06 + 1.8 + 16.007 + 20.5 + 35.204 + 63.6$

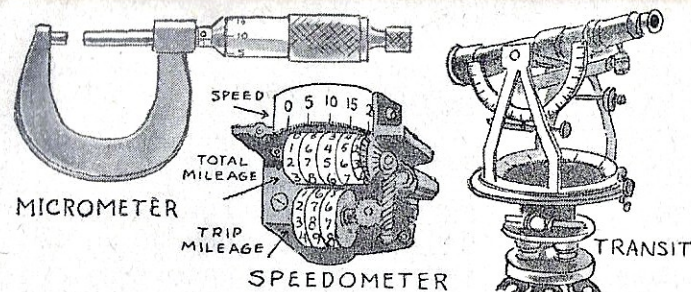
5. $324 + 4.56 + 85.7 + 673 + 75.0604 + 3.219$

Subtract. Write zeros in the minuend when needed.

6. $\begin{array}{r} .8 \\ .3 \\ .5 \\ \hline .35 \end{array}$	$\begin{array}{r} 6.7 \\ .4 \\ .6 \\ \hline .59 \end{array}$	$\begin{array}{r} 1.6 \\ .9 \\ .6 \\ \hline .7 \end{array}$	$\begin{array}{r} 9.1 \\ 2.8 \\ 6.5 \\ \hline 5.9 \end{array}$	$\begin{array}{r} 4.6 \\ 3.7 \\ 3.1 \\ \hline 1.2 \end{array}$	$\begin{array}{r} .13 \\ .05 \\ 9.9 \\ \hline 6. \end{array}$	$\begin{array}{r} 6.05 \\ 3.94 \\ .84 \\ \hline .08 \end{array}$
7. $\begin{array}{r} .9 \\ .31 \\ \hline .319 \end{array}$	$\begin{array}{r} .5 \\ .06 \\ \hline .651 \end{array}$	$\begin{array}{r} .9 \\ .84 \\ \hline .307 \end{array}$	$\begin{array}{r} 1.6 \\ .88 \\ \hline .291 \end{array}$	$\begin{array}{r} 2.3 \\ .23 \\ \hline .043 \end{array}$	$\begin{array}{r} 1.8 \\ 1.46 \\ \hline 13.501 \end{array}$	$\begin{array}{r} 3.04 \\ 1.9 \\ 2.686 \\ \hline \end{array}$

10. $12.5 - .95$ $8.3 - 7.46$ $7.2 - .678$

11. $4.6 - .067$ $78.4 - 2.005$ $10 - .036$



BAROMETER



Some Ways Decimals Are Used

Look in the newspapers for examples of the uses of decimals given below, and bring them to class:

1. Weather Reports. Daily weather reports give the rainfall in inches and hundredths of an inch.

2. Milk Records. On farms each cow's milk is recorded in pounds and tenths of a pound.

3. Stop Watches. Stop watches measure the time of races to fifths and tenths of a second.

4. Speedometers. The speedometer of an automobile measures distance in miles and tenths of a mile.

5. Speed Records. The speed record for automobiles, airplanes, and trains is given to the thousandth of a mile, as 58.764 m.p.h.

6. Team Standings. In baseball, football, and basketball leagues, the standings of the teams are given in thousandths. A standing above .500 means that a team has won more than one-half its games; below .500 means that a team has won less than one-half its games.

7. Land Measurements. Land is measured by a steel tape on which the foot is divided into tenths and hundredths. The transit is also used in measurements.

8. Small Measurements. In factories, very small parts of machines are measured by micrometers, which divide the inch into 1000, 10,000, or even more parts.

9. United States Money. When amounts of money are written, the cents are given as hundredths of a dollar.

Can You Get First Answers Correct?

Add the following:

$$\begin{array}{r}
 1. \quad 4\frac{1}{2} + 5\frac{2}{3} + 3\frac{3}{5} + 6\frac{2}{3} + 2\frac{5}{8} + 4\frac{7}{8} + 7\frac{3}{4} \\
 \quad \quad \quad \underline{2\frac{1}{2}} \quad \quad \underline{3\frac{1}{6}} \quad \quad \underline{4\frac{1}{2}} \quad \quad \underline{3\frac{3}{4}} \quad \quad \underline{1\frac{2}{3}} \quad \quad \underline{2\frac{5}{16}} \quad \quad \underline{3\frac{2}{5}} \\
 \\
 2. \quad 4\frac{1}{2} + 6\frac{5}{6} + 8\frac{4}{5} + 5\frac{1}{6} + 3\frac{3}{10} + 4\frac{1}{4} + 3\frac{2}{3} \\
 \quad \quad \quad \underline{3\frac{1}{2}} \quad \quad \underline{2\frac{1}{3}} \quad \quad \underline{1\frac{1}{4}} \quad \quad \underline{3\frac{1}{2}} \quad \quad \underline{2\frac{1}{2}} \quad \quad \underline{6\frac{5}{8}} \quad \quad \underline{4\frac{1}{4}} \\
 \quad \quad \quad \underline{2\frac{1}{2}} \quad \quad \underline{3\frac{3}{8}} \quad \quad \underline{5\frac{1}{2}} \quad \quad \underline{6\frac{3}{4}} \quad \quad \underline{4\frac{3}{5}} \quad \quad \underline{1\frac{3}{16}} \quad \quad \underline{2\frac{5}{12}} \\
 \\
 3. \quad 6.3 + .078 + 6 + 2.39 \qquad \qquad .04 + .4 + 3.667 + .098
 \end{array}$$

Subtract and prove the following:

$$\begin{array}{r}
 4. \quad 5\frac{1}{2} - 6\frac{5}{6} - 4\frac{1}{4} - 5\frac{7}{8} - 8\frac{1}{5} - 4\frac{1}{6} - 3\frac{4}{5} \\
 \quad \quad \quad \underline{2\frac{1}{2}} \quad \quad \underline{3\frac{1}{2}} \quad \quad \underline{2\frac{1}{2}} \quad \quad \underline{3\frac{2}{3}} \quad \quad \underline{1\frac{3}{4}} \quad \quad \underline{3\frac{2}{3}} \quad \quad \underline{1\frac{1}{2}} \\
 \\
 5. \quad 7\frac{1}{2} - 9\frac{3}{10} - 6\frac{5}{8} - 4\frac{1}{3} - 8\frac{1}{6} - 5\frac{5}{8} - 4\frac{1}{4} \\
 \quad \quad \quad \underline{2\frac{1}{2}} \quad \quad \underline{4\frac{3}{5}} \quad \quad \underline{1\frac{1}{4}} \quad \quad \underline{1\frac{7}{8}} \quad \quad \underline{5\frac{1}{2}} \quad \quad \underline{2\frac{5}{6}} \quad \quad \underline{3\frac{7}{8}} \\
 \\
 6. \quad 7\frac{7}{10} - 5\frac{1}{2} - 6\frac{1}{8} - 8\frac{1}{2} - 6\frac{1}{4} - 3\frac{4}{9} - 9\frac{5}{6} \\
 \quad \quad \quad \underline{6\frac{1}{2}} \quad \quad \underline{2\frac{2}{3}} \quad \quad \underline{5\frac{1}{3}} \quad \quad \underline{4\frac{9}{10}} \quad \quad \underline{2\frac{2}{3}} \quad \quad \underline{1\frac{1}{3}} \quad \quad \underline{3\frac{7}{8}}
 \end{array}$$

Multiply the following. Check answers.

$$\begin{array}{r}
 7. \quad \frac{3}{4} \times 7 \qquad \frac{3}{4} \times \frac{5}{6} \qquad \frac{9}{10} \times \frac{5}{6} \qquad 1\frac{1}{4} \times 12 \qquad \frac{2}{3} \times 16 \\
 8. \quad 3\frac{1}{2} \times \frac{1}{2} \qquad \frac{5}{8} \times 2\frac{1}{2} \qquad \frac{3}{4} \times 3\frac{1}{2} \qquad \frac{5}{8} \times 7 \qquad \frac{3}{4} \times 25 \\
 9. \quad 1\frac{1}{4} \times 2\frac{3}{4} \qquad 2\frac{1}{3} \times 2\frac{4}{5} \qquad 5\frac{1}{3} \times \frac{9}{10} \qquad 1\frac{1}{2} \times 1\frac{2}{3} \qquad 6\frac{3}{4} \times 2\frac{2}{3} \\
 10. \quad 4\frac{1}{2} \times 2\frac{5}{6} \times 1\frac{1}{2} \qquad 2\frac{2}{3} \times 7\frac{1}{2} \times 12 \qquad \frac{9}{10} \times 1\frac{5}{6} \times 3\frac{3}{4}
 \end{array}$$

Divide the following. Prove by multiplying the quotient by the divisor.

$$\begin{array}{r}
 11. \quad \frac{3}{4} \div 2 \qquad \frac{3}{4} \div \frac{1}{6} \qquad 5 \div \frac{2}{3} \qquad \frac{2}{3} \div \frac{3}{4} \qquad \frac{4}{5} \div 3 \\
 12. \quad 6 \div \frac{3}{4} \qquad 2\frac{1}{2} \div \frac{1}{6} \qquad 2\frac{1}{5} \div \frac{1}{4} \qquad 3\frac{1}{2} \div 3\frac{1}{2} \qquad 3\frac{2}{3} \div 1\frac{1}{4} \\
 13. \quad 2\frac{1}{4} \div 3\frac{1}{3} \qquad 3\frac{3}{4} \div 1\frac{1}{8} \qquad 4\frac{1}{6} \div 1\frac{3}{4} \qquad 5\frac{5}{6} \div 7 \qquad 9 \div 1\frac{1}{2} \\
 14. \quad \frac{4}{5} \div \frac{2}{3} \qquad 7 \div 1\frac{2}{3} \qquad 2\frac{1}{4} \div \frac{1}{3} \qquad 5\frac{2}{3} \div 1\frac{1}{6} \qquad 6\frac{3}{4} \div 1\frac{2}{3}
 \end{array}$$

Decimals on the Farm

1. At \$1.25 a bushel, what did the tenant on Mr. Jones's farm have to pay for 200 bu. of seed wheat?
2. Mr. Jones kept a record of the rainfall in his county. Last May it was 2.1 inches, and this May it was 6.7 inches. How much greater was the rainfall this May?
3. Henry rode his bicycle from the farm to town. His speedometer showed 7.4 miles when he reached town and 17.6 when he arrived home by another road. How much farther did he ride returning to the farm than going to town?
4. The farmer had 2 cans of milk holding 10.25 and 8.75 gal. At \$.24 a gallon, how much did he get for milk?
5. In one day two cows gave 29.25 lb. and 32.5 lb. of milk. How much did the milk of both cows weigh?
6. Six of the farmer's cows gave 24.25, 29.25, 27.8, 24.65, 32.5, and 27.75 lb. of milk in one day. Arrange these amounts in order, giving the largest first, and then find how many pounds of milk the six cows gave.
7. When Mr. Jones left for his farm, his speedometer showed 28276.4 miles. When he returned it was 28200.1 miles. How far did he drive?
8. The farmer planted 30.5 acres in wheat, 40.6 acres in corn, and 20.4 acres in oats, leaving the rest of his fields for pasture. How much was there for pasture if all the fields totaled 120 acres?
9. The ground on which the house and barns stood was 15.1 rods long and 20.3 rods wide. What was the perimeter of this ground?
10. On Thanksgiving Day the temperature was 34.6 degrees and on Christmas it was 14.7 degrees. On which day was it colder, and how much colder was it?

Unit 18. Multiplication of Decimals

Pointing Off in Multiplying Decimals

1. Mr. Brown paid \$9.75 a ton for 9 tons of coal. What was the cost of this coal?

When you multiply \$9.75 by 9, you multiply a decimal by a whole number. How many decimal places are there in the multiplicand? in the product?

\$9.75
9
\$87.75

2. A gallon of milk weighs 8.6 pounds. What is the weight of 5 gallons of milk?

Multiply as with whole numbers. Count the decimal places in the multiplicand. How many decimal places do you point off in the product? The answer is 43 lb.

8.6
5
43.0

3. Each block in a town is .125 of a mile long. How many miles long are 16 blocks?

4. Read each product and explain the number of decimal places. Note that 1.80 = 1.8, and 4.0 = 4.

46	.5	.8	.07	.009	8.643	\$5.67
4	8	6	5	8	7	3
180	4.0	4.8	.35	.072	60.501	\$17.01

Multiply the following:

9.07	4.36	.063	3.25	7.086	.99
6	5	8	4	7	4
.605	7.45	.875	.076	4.327	.02
78	27	48	56	88	5
9.402	34.75	624.9	.0752	6.008	.03
87	38	59	86	94	10

Add, Subtract, Multiply, or Divide?

For each step write A, S, M, or D. Work the problems.

1. At 17.5 miles per gallon of gasoline, how many miles will an automobile travel on 8 gallons of gasoline?

2. How many hours did John spend on his arithmetic last week if he spent 45 min. on each of the five days?

3. Find the cost of 6 gal. of sirup at 70¢ a quart.

4. A village block, which is $\frac{1}{8}$ of a mile long, has 6 houses on each side of the street. What is the average width in feet of the house lots?

5. A farmer cut 21 tons of hay from a 6-acre field. How many tons per acre did he get?

6. Mr. Harper drove his car 275.6 mi. on Monday and 287 mi. on Tuesday. How much farther did he drive on Tuesday than on Monday?

7. On Wednesday Mr. Harper drove 169.5 miles. How far did he drive on the three days? (See problem 6.)

8. At \$.12 $\frac{1}{2}$ a can, what is the cost of 16 cans of corn?

9. What is the area of a lawn that is 45 feet long and 22.5 feet wide?

10. How much did Mrs. Brown pay for a turkey weighing 12 $\frac{3}{4}$ lb. at 32¢ per pound?

11. A farmer's cow gave 1 $\frac{3}{4}$ gal. of milk both morning and evening. How many quarts of milk did the cow give in one day?

12. An airplane leaving New York for the West travels 165.5 miles per hour. How far does it go in 12 hours?

13. When the rainfall averages 2.65 inches a month, what is the total rainfall a year?

Multiplying Decimals by Decimals

1. Water weighs about 8.4 pounds per gallon. What is the weight of 7.5 gallons of water?

Multiply as with whole numbers. Then point off as many decimal places in the product as there are in both multiplicand and multiplier. Cross out the two zeros at the right of the decimal point. 63 is the same as 63.00. The answer is 63 lb.

8.4
7.5
420
588
63.00

Explain the number of decimal places in each of the following products; then read them.

8. $\begin{array}{r} .8 \\ .4 \\ \hline .32 \end{array}$	$\begin{array}{r} .07 \\ .3 \\ \hline .021 \end{array}$	$\begin{array}{r} .05 \\ .05 \\ \hline .0025 \end{array}$	$\begin{array}{r} 4.019 \\ .5 \\ \hline 2.0095 \end{array}$	$\begin{array}{r} 42.6 \\ .08 \\ \hline 3.408 \end{array}$
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9. $\begin{array}{r} .05 \\ .2 \\ \hline .010 \end{array}$	$\begin{array}{r} .05 \\ .02 \\ \hline .0010 \end{array}$	$\begin{array}{r} .075 \\ .3 \\ \hline .0225 \end{array}$	$\begin{array}{r} .075 \\ .8 \\ \hline .0600 \end{array}$	$\begin{array}{r} 2.036 \\ .4 \\ \hline .8144 \end{array}$
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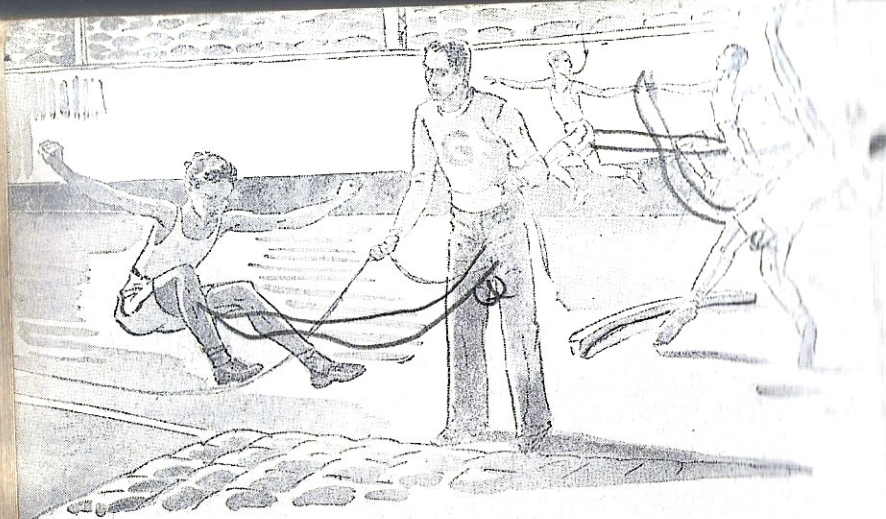
10. $\begin{array}{r} 6.4 \\ 4.8 \\ \hline 512 \\ 256 \\ \hline 30.72 \end{array}$	$\begin{array}{r} 3.79 \\ .75 \\ \hline 1895 \\ 2653 \\ \hline 2.8425 \end{array}$	$\begin{array}{r} .078 \\ .43 \\ \hline 234 \\ 312 \\ \hline .03354 \end{array}$	$\begin{array}{r} 6.75 \\ .48 \\ \hline 5400 \\ 2700 \\ \hline 3.2400 \end{array}$
--	--	--	--

Multiply. To check, multiply again.

11. $\begin{array}{r} 6.3 \\ .7 \\ \hline \end{array}$	$\begin{array}{r} 5.8 \\ .09 \\ \hline \end{array}$	$\begin{array}{r} 75 \\ .06 \\ \hline \end{array}$	$\begin{array}{r} 3.41 \\ .04 \\ \hline \end{array}$	$\begin{array}{r} 6.35 \\ .7 \\ \hline \end{array}$	$\begin{array}{r} .85 \\ .08 \\ \hline \end{array}$
--	---	--	--	---	---

12. $\begin{array}{r} 32.6 \\ .014 \\ \hline \end{array}$	$\begin{array}{r} 6.41 \\ .012 \\ \hline \end{array}$	$\begin{array}{r} .097 \\ 2.3 \\ \hline \end{array}$	$\begin{array}{r} .058 \\ .42 \\ \hline \end{array}$	$\begin{array}{r} 5.7 \\ 2.7 \\ \hline \end{array}$	$\begin{array}{r} 9.6 \\ .17 \\ \hline \end{array}$
---	---	--	--	---	---

13. $\begin{array}{r} .96 \\ .45 \\ \hline \end{array}$	$\begin{array}{r} 1.87 \\ .34 \\ \hline \end{array}$	$\begin{array}{r} 78.6 \\ .87 \\ \hline \end{array}$	$\begin{array}{r} 5.79 \\ 3.6 \\ \hline \end{array}$	$\begin{array}{r} .965 \\ 6.7 \\ \hline \end{array}$	$\begin{array}{r} 8.05 \\ 7.8 \\ \hline \end{array}$
---	--	--	--	--	--



The Track Meet

The Wilson High School was holding its annual indoor track meet, and all the boys were trying hard to make new records.

1. The track was .25 mi. long. How many laps would a boy run in the 1000-yd. race?
2. In the shot-put three of the boys made throws of 38.6 ft., 42.2 ft., and 41.11 ft. What is the difference between the throws of the first and the second, the first and the third, and the second and the third?
3. In a relay race four boys ran 440 yd. What part of a mile did each boy run?
4. In the 220-yd. dash, John finished in 26.8 sec. and Henry in 24.3 sec. How much less time did Henry take?
5. The school charged \$.25 admission to the track meet, and 307 people attended. How much money was received?
6. In the running broad jump Tom jumped 18 ft. 10 in., and George jumped 16 ft. 11 in. How much farther did Tom jump?

Multiplying by 10, 100, and 1000

To multiply a whole number by 10, 100, or 1000, annex as many zeros to the number as there are zeros in the multiplier.

$$\begin{aligned} 10 \times 35 &= 350 \\ 100 \times 35 &= 3500 \\ 1000 \times 35 &= 35000 \end{aligned}$$

Multiply each of the numbers below by 10; then by 100, and then by 1000.

$$6 \quad 10 \quad 20 \quad 16 \quad 350 \quad 200 \quad 705 \quad 1000$$

The shortest way to multiply a decimal by 10, 100, or 1000 is to move the decimal point as many places to the right as there are zeros in the multiplier.

$$\begin{aligned} 10 \times 7.5 &= 75 \\ 100 \times 7.5 &= 750 \\ 1000 \times 7.5 &= 7500 \end{aligned}$$

Explain the product in each of the following:

$$\begin{aligned} 1. \quad 10 \times .5 &= 5 & 100 \times .4 &= 40 & 1000 \times .8 &= 800 \\ 2. \quad 10 \times .05 &= .5 & 100 \times .37 &= 37 & 1000 \times .875 &= 875 \\ 3. \quad 10 \times 1.5 &= 15 & 100 \times .015 &= 1.5 & 1000 \times 87.5 &= 87,500 \end{aligned}$$

Multiply each of the following decimals by 10; then by 100, and then by 1000:

$$\begin{aligned} 4. \quad 2.5 & \quad .25 & \quad .025 & \quad 37.4 & \quad .375 & \quad 2.45 \\ 5. \quad 3.16 & \quad 9.3 & \quad 1.05 & \quad .85 & \quad 6.03 & \quad \$1.18 \\ 6. \quad \$7.75 & \quad 4.8 & \quad 1.01 & \quad 7.26 & \quad .008 & \quad \$4.50 \end{aligned}$$

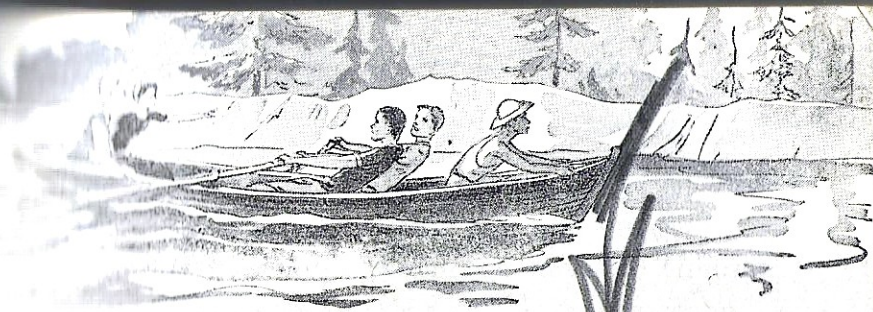
Write the products of the following:

$$\begin{aligned} 7. \quad 6 \times .4 & \quad 5 \times 1.2 & \quad 4 \times 2.5 & \quad 3 \times .04 \\ 8. \quad .5 \times .6 & \quad .7 \times .6 & \quad 10 \times 3.2 & \quad .3 \times 1.2 \\ 9. \quad 4 \times .09 & \quad .1 \times .5 & \quad .7 \times 1.1 & \quad .7 \times .08 \\ 10. \quad .5 \times 12 & \quad .1 \times .1 & \quad .1 \times .01 & \quad .4 \times .03 \end{aligned}$$

Mixed Problems

Write A, S, M, or D for each step. Work the problems.

1. What is the area of a floor 15.7 ft. by 11.25 ft.?
2. In four days Mr. Roberts drove his automobile 397.8 mi., 429.5 mi., 278.6 mi., and 469.9 mi. How far did he drive during these four days?
3. A farmer sold 124 bu. of potatoes at 35¢ a bushel. How much did he receive for his potatoes?
4. A gallon of water weighs 8.36 lb. and a gallon of milk 8.6 lb. How much more do ten gallons of milk weigh than 10 gallons of water?
5. At the beginning of our trip the speedometer read 4067.3 mi., and at the end of the trip it read 6458.7 mi. How far did we drive on this trip?
6. At 19.4¢ per gallon, what is the cost of 8.5 gallons of gasoline? (Write \$.194 for 19.4¢.)
7. At 45¢ a square foot, how much will it cost to lay a floor 12.5 ft. by 14.75 ft.?
8. A cubic foot of water weighs 62.5 lb., and a cubic foot of lead weighs 11.3 times as much. What is the weight of 10 cu. ft. of lead?
9. A jar holds $1\frac{1}{2}$ qt. of water. How much will it hold if it is $\frac{3}{4}$ full?
10. How many square inches are there in a pane of glass 8.5 in. by 11.75 in.?
11. How much must be paid for $\frac{2}{3}$ yd. of ribbon at 70¢ a yard and $\frac{3}{4}$ yd. of lace at \$1.80 a yard?
12. Harry and his father wanted to drive 600 miles in three days. The first day they went 148 miles. How much must they average in the two remaining days?



Unit 19. Division of Decimals

Dividing a Decimal by a Whole Number

1. Five boys bought a rowboat for \$11.50. What was each boy's share of the cost?

Divide as in whole numbers. Write the \$ and place a decimal point in the quotient over the decimal point in the dividend. The answer is \$2.30. Proof: $5 \times \$2.30 = \$11.50$.

$$\begin{array}{r} \$2.30 \\ 5 \overline{) \$11.50} \end{array}$$

2. The boys rowed the boat 16.2 mi. in 3 hr. What was the average speed per hour?

Divide as in whole numbers. Place a decimal point in the quotient over the decimal point in the dividend. The answer is 5.4 mi.

$$\begin{array}{r} 5.4 \\ 3 \overline{) 16.2} \end{array}$$

Divide. Prove each answer. Read the quotients.

- | | | | | | |
|---|---|---|---|--|---|
| 1. $\begin{array}{r} \$13 \\ 6 \overline{) \$78} \end{array}$ | 2. $\begin{array}{r} 13 \\ 6 \overline{) 78} \end{array}$ | 3. $\begin{array}{r} 1.3 \\ 6 \overline{) 7.8} \end{array}$ | 4. $\begin{array}{r} .6 \\ 4 \overline{) 2.4} \end{array}$ | 5. $\begin{array}{r} .04 \\ 6 \overline{) .24} \end{array}$ | 6. $\begin{array}{r} .003 \\ 8 \overline{) .024} \end{array}$ |
| 7. $\begin{array}{r} 3.69 \\ 3 \overline{) 11.07} \end{array}$ | 8. $\begin{array}{r} 7.5 \\ 5 \overline{) 37.5} \end{array}$ | 9. $\begin{array}{r} .08 \\ 2 \overline{) .16} \end{array}$ | 10. $\begin{array}{r} 3.5 \\ 7 \overline{) 12.25} \end{array}$ | 11. $\begin{array}{r} \$.09 \\ 3 \overline{) \$.27} \end{array}$ | 12. $\begin{array}{r} 4.8 \\ 6 \overline{) 28.8} \end{array}$ |
| 13. $\begin{array}{r} .18 \\ 6 \overline{) 1.08} \end{array}$ | 14. $\begin{array}{r} 4.5 \\ 9 \overline{) 40.5} \end{array}$ | 15. $\begin{array}{r} .14 \\ 7 \overline{) 1.96} \end{array}$ | 16. $\begin{array}{r} .08 \\ 8 \overline{) 1.04} \end{array}$ | 17. $\begin{array}{r} \$.72 \\ 6 \overline{) \$ 4.32} \end{array}$ | 18. $\begin{array}{r} 9.18 \\ 9 \overline{) 82.62} \end{array}$ |
| 19. $\begin{array}{r} \$.27 \\ 3 \overline{) \$ 2.70} \end{array}$ | 20. $\begin{array}{r} 8.4 \\ 4 \overline{) 67.2} \end{array}$ | 21. $\begin{array}{r} .20 \\ 5 \overline{) 2.00} \end{array}$ | 22. $\begin{array}{r} .40 \\ 8 \overline{) 3.20} \end{array}$ | 23. $\begin{array}{r} .30 \\ 6 \overline{) 1.80} \end{array}$ | 24. $\begin{array}{r} .42 \\ 6 \overline{) 2.52} \end{array}$ |
| 25. $\begin{array}{r} 4.708 \\ 4 \overline{) 18.832} \end{array}$ | 26. $\begin{array}{r} .042 \\ 6 \overline{) .252} \end{array}$ | 27. $\begin{array}{r} \$ 5.85 \\ 9 \overline{) \$ 52.65} \end{array}$ | 28. $\begin{array}{r} .912 \\ 3 \overline{) 8.196} \end{array}$ | 29. $\begin{array}{r} 6.48 \\ 8 \overline{) 51.84} \end{array}$ | |
| 30. $\begin{array}{r} 6.32 \\ 8 \overline{) 50.56} \end{array}$ | 31. $\begin{array}{r} \$ 7.42 \\ 7 \overline{) \$ 55.94} \end{array}$ | 32. $\begin{array}{r} 50.4 \\ 7 \overline{) 422.8} \end{array}$ | 33. $\begin{array}{r} .972 \\ 9 \overline{) 8.748} \end{array}$ | 34. $\begin{array}{r} .088 \\ 4 \overline{) .704} \end{array}$ | |
| 35. $\begin{array}{r} 8.61 \\ 7 \overline{) 69.27} \end{array}$ | 36. $\begin{array}{r} 69.3 \\ 9 \overline{) 623.7} \end{array}$ | 37. $\begin{array}{r} 60.6 \\ 6 \overline{) 545.4} \end{array}$ | 38. $\begin{array}{r} .405 \\ 5 \overline{) 3.645} \end{array}$ | 39. $\begin{array}{r} \$ 1.05 \\ 7 \overline{) \$ 7.35} \end{array}$ | |

Problems

Write A, S, M, or D for each step. Work the problems.

1. Mr. Allen drove his car 236.6 mi. on 13 gallons of gasoline. How many miles per gallon did he get?

2. Find the area of a lot 187.2 ft. by 86.3 ft.

3. Edward had a board that was 5 ft. 9 in. long. He cut off a piece that was 2 ft. 4 in. long. How much of the original piece remained?

4. What is the average weight of 6 girls if their total weight is 633.5 pounds?

5. How many bookmarks can you make out of $3\frac{1}{2}$ yd. of ribbon, if you use $\frac{1}{6}$ yd. of ribbon for each bookmark?

6. How many bushels of wheat will be needed to sow 80 acres if $1\frac{3}{4}$ bushels are used per acre?

7. At \$6.85 per bushel, what is the cost of 7.75 bu. of hybrid seed corn?

8. Irvin paid \$3.89 for a sweater, 59¢ for a cap, and 67¢ for shoe laces. What change did he receive from \$5.00?

9. In six months Mary gained $5\frac{1}{4}$ pounds. What was her average monthly gain?

10. Fourteen girls are making dresses in sewing class. If each dress has 16 buttons, how many dozen will they need?

11. How many square rods are there in a rectangular field that is 13.5 rods by 8.32 rods?

12. What is the price per acre of land selling at \$3000 for $8\frac{1}{4}$ acres?

13. The inside measurements of a watering tank are 66 in. in length, 28 in. in width, and 15.5 in. in depth. How many gallons does it hold? (1 gal. = 231 cu. in.)

Changing Common Fractions to Decimals

1. A basketball team won 7 games out of 8 games played, or $\frac{7}{8}$ of its games. Change $\frac{7}{8}$ to the decimal form.

Think $\frac{7}{8}$ means $7 \div 8$. Place a decimal point after 7 and divide by 8, annexing zeros as needed. $\frac{7}{8} = .875$. The

team won .875 of its games. Proofs: $8 \times .875 = 7$. $\frac{7}{8} = \frac{875}{1000} = \frac{7}{8}$.

$$\begin{array}{r} .875 \\ 8 \overline{)7.000} \end{array}$$

2. In the examples below, $\frac{1}{3}$, $\frac{2}{3}$, $\frac{1}{4}$, $\frac{3}{4}$, and $\frac{1}{5}$ are changed to decimals. Prove each answer.

$$\begin{array}{r} .33\bar{3} \\ 3 \overline{)1.00} \end{array} \quad \begin{array}{r} .6 \\ 5 \overline{)3.0} \end{array} \quad \begin{array}{r} .125 \\ 8 \overline{)1.000} \end{array} \quad \begin{array}{r} .66\bar{6} \\ 3 \overline{)2.00} \end{array} \quad \begin{array}{r} .16\bar{6} \\ 6 \overline{)1.00} \end{array}$$

To change a common fraction to a decimal, divide the numerator by the denominator. Annex zeros after the decimal point in the dividend as needed.

Change the following to decimals. Prove each answer in two ways.

$$\frac{1}{2}, \frac{1}{4}, \frac{3}{4}, \frac{1}{5}, \frac{2}{5}, \frac{3}{5}, \frac{4}{5}, \frac{1}{8}$$

$$\frac{1}{3}, \frac{2}{3}, \frac{1}{6}, \frac{5}{6}, \frac{1}{7}$$

$$\frac{1}{9}, \frac{2}{9}, \frac{8}{9}, \frac{1}{12}, \frac{5}{12}, \frac{5}{16}, \frac{17}{20}$$

$$\frac{1}{25}, \frac{13}{25}, \frac{23}{50}, \frac{4}{15}, \frac{7}{10}, \frac{17}{40}, \frac{9}{32}, \frac{7}{12}$$

Practice until you can write the decimal value for each of the fractions below from memory.

$$\frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{5}, \frac{1}{6}, \frac{1}{8}, \frac{1}{10}, \frac{1}{12}$$

$$\frac{1}{4}, \frac{3}{4}, \frac{2}{5}, \frac{3}{8}, \frac{5}{8}, \frac{7}{8}, \frac{1}{20}, \frac{1}{25}$$

Change the following to fractions. Example: $.25 = \frac{1}{4}$.

$$.25, .50, .75, .2, .05, .04, .6$$

$$.33\bar{3}, .66\bar{6}, .16\bar{6}, .125, .625, .875$$

Sight Problems

Answer the questions.

1. At 1.6 bu. per acre, how many bushels of seed wheat are needed for 80 acres?

2. A box is 3 feet long, 2 feet wide, and 1.5 feet deep. How many cubic feet are there in the box?

3. The pendulum of a small clock swings from left to right in .9 of a second and from right to left in exactly the same time. How many seconds does it take the pendulum to move from left to right and back to the left?

4. The standing of the Chicago Cubs was .625 and that of the St. Louis Cardinals .8750. Find the difference in the standings of the two clubs.

5. A boy worked 3 hours a day for $4\frac{1}{2}$ days and received 20¢ an hour. How much did he earn?

6. A cubic foot of water weighs about $62\frac{1}{2}$ pounds. What is the weight of the water in a tank containing 10 cubic feet of water?

7. Evelyn needs a yard of lace for a handkerchief. She has a piece 9 in. long. What part of a yard must she buy?

8. On his way to school George walks $\frac{1}{4}$ of a mile on one street and $\frac{3}{8}$ of a mile on another. How far does he walk to school?

9. The gas indicator on an automobile pointed exactly halfway between $\frac{1}{2}$ and $\frac{3}{4}$. What fraction of the tank was full?

10. An airplane traveled 782 miles in four hours. What was its average speed per hour?

11. How many cans of soup at $12\frac{1}{2}$ ¢ apiece can I get for a dollar?

Finding Remainders as Decimals

1. Mr. Brown drove his car 150 miles on 8 gallons of gasoline. Find the average number of miles per gallon.

$$\begin{array}{r} 18\frac{3}{4} \quad 18.75 \\ 8 \overline{)150.00} \end{array}$$

The answer is $18\frac{3}{4}$ mi. If you place a decimal point after 150 and divide by 8, annexing zeros as needed, you change the common fraction to a decimal fraction.

Divide the following. Place a decimal point in the dividend, annex zeros as needed, and divide.

4. $4 \overline{)100}$	8. $8 \overline{)25}$	5. $5 \overline{)16}$	8. $8 \overline{)87}$	8. $8 \overline{)10}$	6. $6 \overline{)39}$
4. $6 \overline{)15}$	4. $4 \overline{)27}$	12. $12 \overline{)33}$	16. $16 \overline{)46}$	25. $25 \overline{)95}$	20. $20 \overline{)74}$
4. $2 \overline{)1}$	4. $4 \overline{)2}$	8. $8 \overline{)19}$	4. $4 \overline{)3}$	25. $25 \overline{)12}$	48. $48 \overline{)78}$
6. $6 \overline{)75}$	24. $24 \overline{)81}$	28. $28 \overline{)77}$	40. $40 \overline{)96}$	24. $24 \overline{)3}$	18. $18 \overline{)45}$

In many cases there will always be a remainder, no matter how many zeros you annex. So the quotient is rounded off to the nearest hundredth or thousandth.

6. Divide 5 by 7 to the nearest thousandth.

$$\begin{array}{r} .7142 \\ 7 \overline{)5.0000} \end{array}$$

Since the fourth quotient figure is less than 5, drop it. The answer is .714, correct to the nearest thousandth; .7142 is nearer .714 than .715.

7. Divide 2 by 3 to the nearest thousandth.

$$\begin{array}{r} .6666 \\ 3 \overline{)2.0000} \end{array}$$

Since the fourth quotient figure is more than 5, drop it and add 1 to the third figure. The answer is .667, correct to the nearest thousandth.

8. Round off each decimal to the nearest thousandth:

4.0093	6.3705	8.5319	6.2198	3.5666
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Problem Practice

For each step write A, S, M, or D. Work the problems.

1. Helen's father bought 15 gallons of gasoline at 18.0¢ and 1 quart of oil at 20¢. What was the total of these purchases?

2. A surveyor found that the front wall of a house was 36 feet $4\frac{1}{2}$ inches long and the back wall 36 feet $3\frac{3}{4}$ inches. How much longer was the front wall?

3. The Emerson School playground is a triangle with a base of 80 yards and an altitude of 30 yards. What is the area of this playground?

4. Jane missed 4 words in a spelling list of 20. What fractional part of the words did she spell correctly? Express the fraction as a decimal.

5. Six ball bearings of equal weight together weigh 19.14 ounces. What do 25 of these ball bearings weigh?

6. Ralph types an average of 600 words in a quarter of an hour. At that rate, how many words does he type in ten minutes?

7. Margaret bought $3\frac{2}{3}$ yards of material at 47¢ a yard. What was the cost?

8. One iron bar is 13.5 ft. long, and another is 17.00 ft. long. Find the difference in length.

9. Harry gained 7 pounds in 1 year. What was the average gain per month?

10. A man earns \$350 per month and pays $\frac{1}{5}$ of it for rent. How much does he pay for rent in a year?

11. Four boys worked $3\frac{1}{2}$ hours each. At $20\frac{1}{2}$ ¢ an hour, how much did they all earn?

Unit 20. Division of Decimals

Rounding Off Quotients

1. In 7 hours, Mr. Owen drove 345.3 miles. Find his average speed per hour to the nearest hundredth of a mile.

Divide to three decimal places. Since the last quotient figure, 8, is more than 5, add 1 to the second last quotient figure, 2. The answer is 49.33 miles.

$$\begin{array}{r} 49.328 \\ 7 \overline{)345.300} \end{array}$$

2. The standing of a baseball team is the decimal fraction, to the nearest thousandth, of the games won. If a team has won half the games it has played, what is its standing?

3. A baseball team won 7 of 12 games played. Find the standing of the team to the nearest thousandth.

Divide to four decimal places. Since the fourth quotient figure, 3, is less than 5, drop it. The answer is .583.

$$\begin{array}{r} .5833 \\ 12 \overline{)7.0000} \end{array}$$

To round off a decimal, drop the last figure if it is less than 5. If the last figure is 5 or more, drop it and add 1 to the figure before it.

Round off each decimal below to the nearest tenth:

4. 5.21 6.47 7.85 4.07 8.98 9.66 7.44 3.09

Round off the following to the nearest hundredth:

5. .864 4.785 3.047 2.806 2.008 1.073

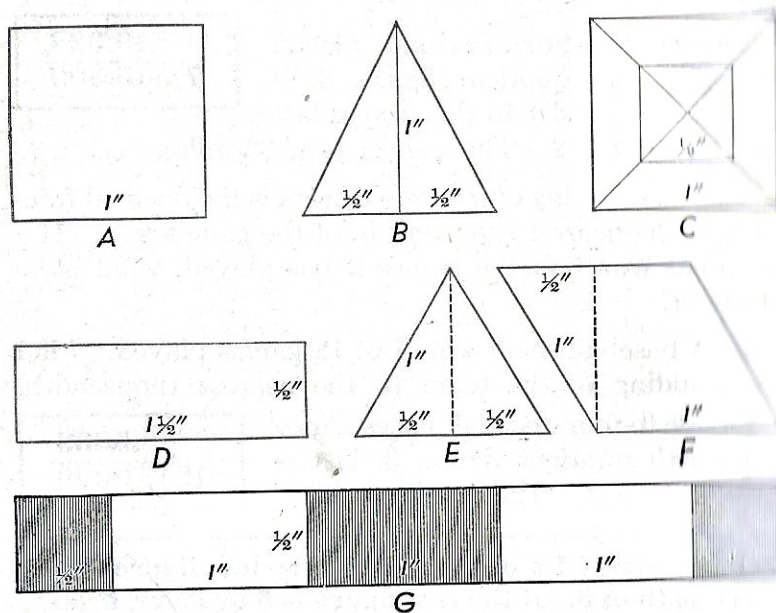
Round off the following to the nearest thousandth:

6. .0836 .7504 .8392 .6407 .0705 .0087

7. 6.4822 5.0966 4.7095 3.1499 8.1633

Scale Drawings

You will often want to make a figure several times as large, or only a half or a fourth as large, as it is in the drawing; that is, you will want to draw the figure to scale. You will find it easier to draw figures to scale if you have cross-ruled paper, but plain paper will do. 1" means 1 inch. 1' means 1 foot.



Draw on paper the seven figures shown above so that

1. In Figure A, 1" will be 3" in your drawing.
2. In Figure B, 1" will be 2.5" in your drawing.
3. In Figure C, 1" will be .5" in your drawing.
4. In Figure D, 1" will be .75" in your drawing.
5. In Figure E, 1" will be 2" in your drawing.
6. In Figure F, 1" will be $.33\frac{1}{3}$ ' in your drawing.
7. In Figure G, 1" will be $\frac{1}{2}$ " in your drawing.

Rounding Off Quotients

Find the quotients, correct to the nearest hundredth.

1. $6\overline{)20}$ $7\overline{)4}$ $9\overline{)5}$ $8\overline{)25}$ $7\overline{)46}$ $6\overline{)1.7}$
2. $12\overline{)7}$ $16\overline{)9}$ $18\overline{)2.4}$ $9\overline{)4}$ $6\overline{)50}$ $13\overline{)7.5}$
3. $11\overline{)90}$ $25\overline{)13}$ $17\overline{)41}$ $16\overline{)55}$ $26\overline{)17}$ $15\overline{)8.5}$
4. $14\overline{)11}$ $19\overline{)12}$ $17\overline{)16}$ $31\overline{)15}$ $21\overline{)16}$ $41\overline{)9.2}$

Divide the following. Quotients must be correct to the nearest thousandth.

5. $24 \div 25$ $18 \div 25$ $17 \div 45$ $13 \div 32$
6. $72 \div 19$ $60 \div 23$ $49 \div 14$ $52 \div 27$
7. $25 \div 46$ $46 \div 25$ $72 \div 19$ $26 \div 39$
8. $55 \div 12$ $70 \div 27$ $90 \div 11$ $46 \div 15$

Change the following to decimals, correct to the nearest hundredth:

9. $\frac{1}{2}$ $\frac{2}{3}$ $\frac{1}{6}$ $\frac{7}{8}$ $\frac{2}{3}$ $\frac{5}{9}$ $\frac{6}{7}$ $\frac{1}{9}$
10. $\frac{3}{8}$ $\frac{1}{3}$ $\frac{5}{8}$ $\frac{4}{7}$ $\frac{1}{5}$ $\frac{3}{4}$ $\frac{4}{5}$ $\frac{7}{12}$
11. $\frac{5}{16}$ $\frac{11}{25}$ $\frac{13}{18}$ $\frac{17}{24}$ $\frac{19}{32}$ $\frac{23}{48}$ $\frac{21}{64}$ $\frac{9}{28}$
12. $4\frac{1}{2}$ $9\frac{1}{2}$ $8\frac{4}{5}$ $6\frac{1}{8}$ $3\frac{1}{4}$ $7\frac{3}{8}$ $2\frac{1}{5}$
13. $5\frac{1}{8}$ $2\frac{2}{5}$ $4\frac{7}{8}$ $9\frac{7}{10}$ $6\frac{3}{5}$ $8\frac{2}{3}$ $4\frac{1}{6}$
14. $6\frac{5}{8}$ $5\frac{4}{9}$ $7\frac{5}{12}$ $4\frac{7}{16}$ $3\frac{11}{20}$ $2\frac{7}{15}$ $6\frac{4}{25}$

Problems

1. A gallon of water weighs about 8.36 pounds. What is the weight of 1 quart of water?
2. Find the perimeter of a lot 151.12 ft. by 50.3 ft.
3. During a race Arthur's boat averaged 11.5 miles an hour. How many miles did it travel in 1.25 hours? Round off the answer to the nearest hundredth.



Problem Practice

1. When ordinary gasoline costs 16.5¢ per gallon and high test 18.2¢ per gallon, how much more expensive is high test gasoline?
2. Mr. White receives \$3.76 for 8 hours of work. How much should he get for $11\frac{1}{2}$ hours of work?
3. Mrs. Allen bought a stove for \$55.00. She paid one half down and the rest in weekly payments of \$2.00. How long did it take her to pay for the stove?
4. An airplane flew 913.2 miles in 4 hours. What was the average speed per hour?
5. Bill has 63 cents, which is 18 cents more than he earned today. How much did he earn today?
6. How much should Stella's father receive for his farm of 80.5 acres if he sells it for \$65 an acre?
7. A cubic foot of water weighs 62.5 lb. Ice weighs .92 as much as water. What does 1 cu. ft. of ice weigh?

Practice with Measures

Find the numbers missing below:

1. 1 sq. yd. = ___ sq. ft. 1 rd. = ___ ft. 1 mi. = ___ ft.
2. 1 A. = ___ sq. rd. 1 sq. mi. = ___ A. 1 ft. = ___ in.
3. 1 ft. 7 in. = ___ in. 8 qt. = ___ pk. 3 lb. = ___ oz.
4. 1 yd. 2 ft. = ___ ft. 3 pk. = ___ qt. 72 hr. = ___ da.
5. 1 gal. 2 qt. = ___ qt. 5 gal. = ___ qt. 17 qt. = ___ gal.
6. 6 rd. 3 ft. = ___ ft. 2 T. = ___ lb. 36 oz. = ___ lb.
7. 1 bu. 2 pk. = ___ pk. 3 min. = ___ sec. 90 min. = ___ hr.

Mixed Practice in Decimals

Find the answers. Watch the signs.

- | | | |
|------------------------------|--------------------|-------------------|
| 1. $6.5 + .14 + 18.3 + .167$ | $7.5 - 3.9$ | 6.7×3.4 |
| 2. $.007 + 2.96 + 17.8 + .9$ | $4 - 1.78$ | $5.7 \div 3$ |
| 3. $.055 + 67 + 4.8 + .07$ | $16.4 \div 93$ | $.15 \times 7.05$ |
| 4. $.075 \div 15$ | $4.9 \times .17$ | $1.7 - .046$ |
| 5. $.92 + 4.8$ | $25.9 \times .685$ | $.7 - .095$ |
| 6. $6.5 \div 8$ | $1.078 + 12.3$ | $.87 \div 4$ |
| 7. $1.2 - .625$ | $.807 \div 7$ | $27 \div 84$ |
| | | $.45 \div 16$ |
| | | $46 \times .127$ |
| | | $31 \div 8$ |

Multiply. Round off products to the nearest thousandth.

- | | | | | | |
|---|---|--|--|---|---|
| 8. $\begin{array}{r} 7.3 \\ 4.1 \\ \hline \end{array}$ | $\begin{array}{r} 164 \\ .76 \\ \hline \end{array}$ | $\begin{array}{r} 24.6 \\ 6.7 \\ \hline \end{array}$ | $\begin{array}{r} 6.92 \\ .49 \\ \hline \end{array}$ | $\begin{array}{r} 8.07 \\ .056 \\ \hline \end{array}$ | $\begin{array}{r} .409 \\ 78 \\ \hline \end{array}$ |
| 9. $\begin{array}{r} .86 \\ 3.8 \\ \hline \end{array}$ | $\begin{array}{r} 252 \\ 4.7 \\ \hline \end{array}$ | $\begin{array}{r} 3.78 \\ 6.9 \\ \hline \end{array}$ | $\begin{array}{r} 24.8 \\ .24 \\ \hline \end{array}$ | $\begin{array}{r} 90.7 \\ 7.2 \\ \hline \end{array}$ | $\begin{array}{r} 8.97 \\ 4.6 \\ \hline \end{array}$ |
| 10. $\begin{array}{r} 9.2 \\ 6.3 \\ \hline \end{array}$ | $\begin{array}{r} 397 \\ .09 \\ \hline \end{array}$ | $\begin{array}{r} .456 \\ .07 \\ \hline \end{array}$ | $\begin{array}{r} .509 \\ 46 \\ \hline \end{array}$ | $\begin{array}{r} 82.5 \\ .007 \\ \hline \end{array}$ | $\begin{array}{r} 38.4 \\ 17.8 \\ \hline \end{array}$ |

Divide. Find quotients to the nearest thousandth.

- | | | | | |
|------------------------|-------------------|---------------------|-----------------------|----------------------|
| 11. $8\overline{)3}$ | $5\overline{)85}$ | $12\overline{)5}$ | $37\overline{)24}$ | $8\overline{)12}$ |
| 12. $7\overline{)6}$ | $6\overline{)8}$ | $14\overline{)7.7}$ | $15\overline{)0.078}$ | $25\overline{)97}$ |
| 13. $9\overline{)5}$ | $4\overline{)13}$ | $15\overline{)62}$ | $13\overline{)6.75}$ | $34\overline{)87.3}$ |
| 14. $3\overline{)4.1}$ | $7\overline{)54}$ | $19\overline{)12}$ | $40\overline{)17.6}$ | $16\overline{)9.75}$ |

Write the common fraction for each decimal below:

- | | | | | | | |
|--------|------------------|-----|------------------|------|------------------|------------------|
| 15. .7 | .4 | .32 | $.33\frac{1}{3}$ | .125 | $.08\frac{1}{3}$ | .50 |
| 16. .2 | .5 | .25 | $.66\frac{2}{3}$ | .375 | $.37\frac{1}{2}$ | .750 |
| 17. .8 | $.11\frac{1}{3}$ | .75 | $.16\frac{2}{3}$ | .625 | .875 | $.14\frac{2}{7}$ |

Problems

1. Mrs. Johnson uses 2 pounds of butter a week. What part of a pound does she use, on the average, per day?

2. Mr. Smith's salary is \$210 a month. Last month he spent $\frac{1}{4}$ of it for rent, $\frac{1}{8}$ for clothing, and $\frac{1}{6}$ for food. How much did he have left for other uses?

3. Mary lives $\frac{3}{8}$ of a mile from school. Helen lives a third of the distance nearer. What part of a mile does Helen live from school?

4. George lives .9 of a mile from school. Henry lives only $\frac{1}{3}$ as far. How far from school does Henry live?

5. In a sewing class there are 14 girls. Each girl uses $\frac{5}{8}$ of a yard of material to make an apron. How many yards do they all use?

6. A dealer bought 160 acres of land at \$30 an acre and sold it at \$45 an acre. How much did he gain?

7. How long will it take an automobile traveling 112 miles per hour to go 217.6 miles?

8. In the running broad jump Bill jumped 7.93 ft. and John 7.39 ft. How much farther did Bill jump?

9. On a map drawn to the scale of 1 in. = 250 mi., two cities are 3.6 in. apart. How many miles apart are they?

Practice in Decimals

1. Write these numbers in figures: Fourteen and one hundred five thousandths; two hundred twenty and twelve hundredths; two hundred sixty-two ten-thousandths.

Round off the following to the nearest thousandth:

2. 8.6483 2.0997 6.8935 4.0013 7.0897
3. 5.089 $\frac{2}{3}$ 6.483 $\frac{3}{4}$ 9.763 $\frac{1}{3}$ 4.639 $\frac{5}{8}$ 8.3671

Fifth Self-Test

Finding Out What You Know about Decimals

1. Add: $6.4 + .86 + 4.96 + 693$ $.025 + 4.9 + 6.375$

2. Multiply each of these by 10, by 100, and by 1000:
7.0 4.68 56.9 .789 .086 2.436

3. Subtract the following. Prove the remainders.
 $12 - 9.7$ $2.4 - .38$ $4.56 - .08$ $.7 - .094$

Change each common fraction below to a decimal:

4. $\frac{9}{10}$ $\frac{3}{5}$ $\frac{3}{4}$ $\frac{1}{3}$ $\frac{1}{8}$ $\frac{3}{8}$ $\frac{5}{8}$ $\frac{7}{8}$
5. $\frac{2}{3}$ $\frac{1}{6}$ $\frac{5}{6}$ $\frac{1}{10}$ $\frac{4}{5}$ $\frac{1}{12}$ $\frac{1}{5}$ $\frac{1}{7}$
6. $\frac{3}{10}$ $\frac{7}{25}$ $\frac{9}{50}$ $\frac{2}{5}$ $\frac{49}{50}$ $\frac{1}{2}$ $\frac{17}{25}$ $\frac{11}{20}$

Multiply the following:

7. $\begin{array}{r} 15 \\ .3 \end{array}$ $\begin{array}{r} .8 \\ .7 \end{array}$ $\begin{array}{r} .47 \\ .6 \end{array}$ $\begin{array}{r} 9.4 \\ .3 \end{array}$ $\begin{array}{r} 5.7 \\ 2.3 \end{array}$ $\begin{array}{r} 7.5 \\ 1.8 \end{array}$ $\begin{array}{r} .34 \\ 2.7 \end{array}$
8. $\begin{array}{r} .58 \\ .44 \end{array}$ $\begin{array}{r} .25 \\ .24 \end{array}$ $\begin{array}{r} .47 \\ .06 \end{array}$ $\begin{array}{r} 64.2 \\ .08 \end{array}$ $\begin{array}{r} .627 \\ 5.4 \end{array}$ $\begin{array}{r} 317 \\ .009 \end{array}$
9. $\begin{array}{r} .07 \\ 4 \end{array}$ $\begin{array}{r} .023 \\ 17 \end{array}$ $\begin{array}{r} .366 \\ 9 \end{array}$ $\begin{array}{r} 8.75 \\ 8 \end{array}$ $\begin{array}{r} .08 \\ .3 \end{array}$ $\begin{array}{r} .07 \\ .05 \end{array}$
10. $\begin{array}{r} .325 \\ 50 \end{array}$ $\begin{array}{r} .097 \\ 3.6 \end{array}$ $\begin{array}{r} .675 \\ .4 \end{array}$ $\begin{array}{r} 28.3 \\ 6.7 \end{array}$ $\begin{array}{r} 4.72 \\ .007 \end{array}$ $\begin{array}{r} 6000 \\ .18 \end{array}$

Divide the following. Prove the quotients.

11. $5 \overline{)2}$ $4 \overline{)3}$ $6 \overline{)18}$ $7 \overline{)45}$ $5 \overline{)3.9}$ $4 \overline{)0.2}$
12. $8 \overline{)1}$ $7 \overline{)2}$ $9 \overline{)6}$ $6 \overline{)9}$ $8 \overline{)45}$ $2 \overline{)17}$
13. $9 \overline{)1.85}$ $12 \overline{)0.48}$ $25 \overline{).75}$ $20 \overline{).03}$ $25 \overline{)1}$
14. $5 \overline{)4.05}$ $50 \overline{)35}$ $9 \overline{)10.05}$ $4 \overline{)1.25}$ $8 \overline{)16.24}$

Test in Problem Solving

Work the problems.

1. The sixth-grade pupils bought $37\frac{1}{2}$ yards of material to be used for costumes in a play. At 24¢ a yard, what was the cost of the material?
2. A 25-ride ticket between Chicago and one of its suburbs cost \$4.75. What was the cost per ride?
3. A storekeeper paid 76¢ apiece for 65 books. He sold them for \$1.20 apiece. How much did he make?
4. How many cubic yards of concrete are there in a basement floor 42 ft. by 27 ft. if the concrete is 8 in. thick? (Reduce the dimensions to yards.)
5. A bin filled with wheat is 15 ft. long, 9 ft. wide, and 8 ft. deep. At 75¢ a bushel, what is the value of the wheat? (1 cu. ft. = $\frac{1}{4}$ bu. 75¢ = $\frac{3}{4}$ dollar.)
6. An airplane flew 796 mi. in 6 hr. What was the average speed per hour, correct to the nearest hundredth?
7. An airplane traveled 870 miles in 4 hours and 50 minutes ($4\frac{5}{6}$ hr.). What was the speed per hour?
8. Tom had a garden. He paid \$5 rent for the land, \$1.50 for planting, \$1.25 for tools, and \$1.75 for seed. He sold vegetables for \$21.50. What was his profit?
9. At \$3.20 a square yard, what is the cost of paving a street 660 feet long and 40 feet wide?
10. Jane's mother bought $6\frac{1}{2}$ yards of material at a sale for \$3.38. How much did she save if the regular price was 70¢ per yard?
11. What was the total rainfall for three months in a town where it was 2.24 in. for the first month, 4.7 in. for the second month, and 5.16 in. for the third month?

Unit 21. Division of Decimals

How to Divide by a Decimal

1. Mr. Allen used 7.5 gallons of gas in driving his car 127.5 miles. What was the average number of miles per gallon?

Change the divisor to a whole number by moving the decimal point one place to the right. Think $10 \times 7.5 = 75$. Place a caret (^) to show the change.

$$\begin{array}{r} 17. \\ 7.5 \wedge \overline{)127.5 \wedge} \\ \underline{75} \\ 525 \\ \underline{525} \\ 000 \end{array}$$

Then multiply the dividend by 10. Think $10 \times 127.5 = 1275$. Place a caret after 5 to show the change.

Then place a decimal point in the quotient directly over the caret. Divide as in whole numbers. The answer is 17. Proof: $7.5 \times 17 = 127.5$.

To divide by a decimal, first count the decimal places in the divisor. Next place a caret (^) as many places to the right of the decimal point in the dividend as there are decimal places in the divisor. Then place a decimal point in the quotient directly over the caret and divide as in whole numbers.

Divide. Prove each division.

1. $1.5 \wedge \overline{)22.5 \wedge}$	2. $15 \wedge \overline{)1.80 \wedge}$	3. $2.5 \wedge \overline{)6.25 \wedge}$	4. $8.5 \wedge \overline{)4.25 \wedge}$
5. $.25 \wedge \overline{)47.5 \wedge}$	6. $.06 \wedge \overline{)7.26 \wedge}$	7. $.09 \wedge \overline{)0.63 \wedge}$	8. $.12 \wedge \overline{)1.44 \wedge}$
9. $4.7 \wedge \overline{)4.23 \wedge}$	10. $.36 \wedge \overline{)252 \wedge}$	11. $.08 \wedge \overline{)1.76 \wedge}$	12. $.9 \wedge \overline{)7.02 \wedge}$
13. $.25 \wedge \overline{)625 \wedge}$	14. $6.1 \wedge \overline{)9.76 \wedge}$	15. $.03 \wedge \overline{)2.88 \wedge}$	16. $4 \wedge \overline{)8.04 \wedge}$

Steps in Placing the Decimal Point

Be sure that you understand these three steps to be taken when dividing by a decimal:

Step 1. Change the divisor to a whole number, shown by placing a caret after its right-hand figure.

Step 2. Place a caret as many places to the right of the decimal point in the dividend as there were decimal places in the divisor.

Step 3. Place a decimal point in the quotient directly over the caret in the dividend and divide.

1. A piece of gold weighs .005 of a gram. Another piece weighs 1.27 grams. The second piece is how many times as heavy as the first piece?

Divide 1.27 by .005.

Count 3 places in the divisor.

Count 3 places to the right of the

decimal point in the dividend and place the caret.

Place the decimal point in the quotient over the caret.

In short, count 3, count 3, place caret, place point.

The answer is 254. Proof: $.005 \times 254 = 1.27$.

$$\begin{array}{r} 254. \\ .005 \overline{)1.270} \end{array}$$

2. What is $1000 \times .005$? 1000×1.27 ?

3. Explain the location of the caret and the decimal point in each example; divide and prove.

$$7.4 \overline{)5.92} \quad .53 \overline{)100.70} \quad .025 \overline{)0.975} \quad .125 \overline{)1.500}$$

Divide and prove:

$$4. \quad .4 \overline{)2.4} \quad .6 \overline{)3.6} \quad .05 \overline{)3.5} \quad .07 \overline{)4.2} \quad .001 \overline{)1}$$

$$5. \quad .6 \overline{)1.7} \quad .08 \overline{)0.72} \quad .09 \overline{)8.16} \quad .03 \overline{)1.11} \quad .6 \overline{)6}$$

$$6. \quad .4 \overline{)34.04} \quad .03 \overline{)4.628} \quad .8 \overline{)8.769} \quad .009 \overline{)4.267}$$

$$7. \quad .33 \overline{)236} \quad 8.2 \overline{)10.5} \quad .026 \overline{)1.85} \quad 4.5 \overline{)35.100}$$

Problem Practice

1. Mr. Jones drove his car an average of 19.5 miles per hour for 8.25 hours. How far did he drive?

2. An airplane flew 493 miles in 4.5 hours. What was the average speed per hour?

3. A merchant sold a dining-room table marked \$36 at $\frac{1}{4}$ off. Find the selling price.

4. When 2.5 tons of coal cost \$21.25, what is the price per ton?

5. Jack started on a trip of 130 miles and had covered $\frac{1}{2}$ of the distance by noon. How much farther did he have to go?

6. The perimeter of a triangle is 38 feet. One side is 14.6 feet, another is 13 feet. What is the length of the third side?

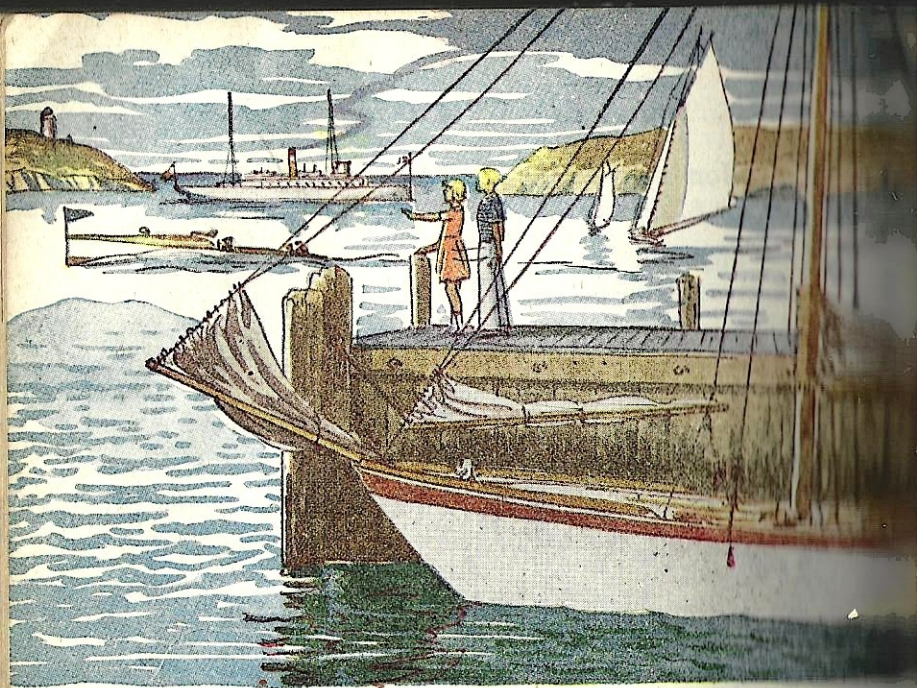
Addition of Decimals

$$\begin{array}{r} 1. \quad \begin{array}{r} .4 \\ .2 \\ .1 \end{array} \quad \begin{array}{r} .5 \\ 6. \\ .9 \end{array} \quad \begin{array}{r} 8. \\ .7 \\ .4 \end{array} \quad \begin{array}{r} 2.6 \\ .7 \\ .78 \end{array} \quad \begin{array}{r} .8 \\ 7. \\ 6.9 \end{array} \quad \begin{array}{r} .6 \\ 2.8 \\ 3.5 \end{array} \quad \begin{array}{r} 5. \\ 9. \\ .8 \end{array} \quad \begin{array}{r} .3 \\ .7 \\ 5. \end{array} \end{array}$$

$$2. \quad \begin{array}{r} .67 \\ .83 \\ .24 \end{array} \quad \begin{array}{r} .79 \\ 9.95 \\ .8 \end{array} \quad \begin{array}{r} .85 \\ 6. \\ .49 \end{array} \quad \begin{array}{r} 7.4 \\ 8.94 \\ 9.4 \end{array} \quad \begin{array}{r} 65. \\ 8.99 \\ 47.6 \end{array} \quad \begin{array}{r} 7. \\ 3.6 \\ .45 \end{array}$$

$$3. \quad \begin{array}{r} .684 \\ 2.31 \\ 10.5 \end{array} \quad \begin{array}{r} 38.2 \\ 5.6 \\ 96. \end{array} \quad \begin{array}{r} .639 \\ 3. \\ .79 \end{array} \quad \begin{array}{r} 8. \\ .344 \\ .793 \end{array} \quad \begin{array}{r} 7.68 \\ .9 \\ .843 \end{array}$$

$$4. \quad \begin{array}{r} 4.696 \\ 32.27 \\ 1.748 \end{array} \quad \begin{array}{r} .9924 \\ 85.46 \\ .627 \end{array} \quad \begin{array}{r} 65.49 \\ 3.998 \\ 987.5 \end{array} \quad \begin{array}{r} 5.385 \\ 490.6 \\ 9.379 \end{array}$$



Knots and Nautical Miles

The speed at which a ship is traveling is usually given in knots. A ship making 30 knots is traveling 30 nautical miles, or sea miles, per hour.

1. A nautical mile is 6080.20 feet. How much longer is a nautical mile than a land mile?

2. A ship making 30 knots is traveling how many land miles per hour? Give the answer to two decimal places.

3. How many hours will it take a boat making an average of 30 knots to go from New York to Boston if the course taken is 378 nautical miles?

4. A ship going from New York to San Francisco via the Panama Canal travels a distance of 5,262 nautical miles. How many land miles is this?

5. A land mile is what part of a nautical mile? Give the answer to two decimal places.

Dividing a Whole Number by a Decimal

1. Arthur rode his bicycle 31 miles in 2.5 hours. What was his average speed per hour?

Multiply both 2.5 and 31 by 10. Place a caret in the dividend to show where to place the decimal point in the quotient. How do you locate this place? $10 \times 2.5 = \underline{\quad}$. $10 \times 31 = \underline{\quad}$. Why do you multiply 2.5 by 10? How do you prove the answer?

$$\begin{array}{r} 12.4 \\ 2.5 \overline{)31.0\overset{\wedge}{0}} \\ \underline{25} \\ 60 \\ \underline{50} \\ 100 \\ \underline{100} \end{array}$$

The examples at the right show that when you multiply both the divisor and the dividend by the same number, you do not change the quotient.

$$\begin{array}{l} 8 \div 4 = 2 \\ 80 \div 40 = 2 \\ 800 \div 400 = 2 \end{array}$$

Multiplying both divisor and dividend by the same number does not change the quotient.

Divide. Prove your answers.

- | | | | | |
|------------------------------|-----------------------------|-----------------------------|-----------------------------|----------------------------|
| 1. $.5 \overline{)18}$ | 2. $.7 \overline{)84}$ | 3. $.09 \overline{)27}$ | 4. $1.5 \overline{)14}$ | 5. $.012 \overline{)95}$ |
| 6. $.13 \overline{)42}$ | 7. $.06 \overline{)81}$ | 8. $.75 \overline{)375}$ | 9. $6.5 \overline{)195}$ | 10. $.088 \overline{)416}$ |
| 11. $12.5 \overline{)11.5}$ | 12. $.24 \overline{)1.116}$ | 13. $2.14 \overline{)7206}$ | 14. $87 \overline{)5.9508}$ | |
| 15. $.56 \overline{)770}$ | 16. $.32 \overline{).0672}$ | 17. $.032 \overline{)67.2}$ | 18. $4.2 \overline{)46.75}$ | |
| 19. $12.6 \overline{)80.74}$ | 20. $7.5 \overline{)1000}$ | 21. $.48 \overline{)60}$ | 22. $1.2 \overline{)9.6}$ | |
| 23. $.11 \overline{)2.64}$ | 24. $.125 \overline{)18}$ | 25. $.075 \overline{)50}$ | 26. $.625 \overline{)30}$ | |
| 27. $75 \div 1.5$ | 28. $9 \div .45$ | 29. $24 \div .16$ | 30. $.63 \div .009$ | |
| 31. $80 \div 2.5$ | 32. $4 \div 1.25$ | 33. $12 \div .02$ | 34. $.435 \div 1.5$ | |

Problem Practice

Write the answers.

- At 60¢ per cubic yard, what is the cost of digging a basement 24.5 feet long, 18.5 feet wide, and 7.5 feet deep?
- On February 1 Mary had \$16.32 in the bank. During the month she deposited \$2.85 and \$4.95 and withdrew \$8.73. How much money did she have on deposit at the end of the month?
- Mrs. Hill paid \$3.78 for a turkey weighing 13.5 lb. What was the price per pound?
- At an average of 16.8 mi. per gallon, how many gallons of gasoline did Mr. Brown and his son need for a trip of 1875 miles?
- A dealer divided $4\frac{1}{2}$ acres of land into lots of $\frac{1}{4}$ of an acre. He sold each lot for \$765. How much did he receive for the lots?
- Mrs. Johnson drove 152 miles in 4.75 hours. At this rate, how far will she drive in 7 hours?
- A wheel is 7.5 feet in circumference. How many times will it turn around in going 1 mile?
- A train due at 7:27 P.M. was 50 minutes late. When did the train arrive?
- When $\frac{2}{3}$ of a yard of cloth costs 18¢, what is the price per yard?
- A can of paint weighed 14.2 lb. The empty can weighed 1.3 lb. How much did the paint weigh?
- What is the perimeter of a lot $157\frac{1}{2}$ ft. long and $75\frac{1}{4}$ ft. wide?

Unit 22. Division of Decimals

Dividing by 10, 100, or 1000

- Mr. Hill sold 1460 lb. of milk at \$2 a hundredweight. How much did he receive for the milk?

$$\begin{array}{r} 14.60 \\ 2 \\ \hline 29.20 \end{array}$$

A hundredweight (cwt.) = 100 lb. Think $1460 \div 100 = 14.60$. To divide 1460 by 100, move the decimal point two places to the left.

$$14.60 \times 2 = 29.20. \text{ He received } \$29.20.$$

- A builder bought 9600 feet of lumber at \$45 per M. What did this lumber cost?

Lumber is usually sold by the M, or 1000 board feet. To find the number of M, think $9600 \div 1000 = 9.6$.

$$\begin{array}{r} 9.6 \\ 45 \\ \hline 480 \\ 384 \\ \hline 432.0 \end{array}$$

Multiply 9.6 by 45. The cost of the lumber was \$432.

To divide a number by 10, 100, or 1000, move the decimal point as many places to the left as there are zeros in the divisor.

Read and explain each example below:

- $36 \div 10 = 3.6$ $3.5 \div 10 = .35$ $.4 \div 10 = .04$
- $12.5 \div 100 = .125$ $675 \div 100 = 6.75$
- $7 \div 100 = .07$ $7.976 \div 1000 = .007976$

Divide each number below by 10; by 100; by 1000:

- | | | | | | |
|--------|------|------|-------|-------|------|
| 6. 75 | 675 | 75.3 | 1560 | 5000 | 51.8 |
| 7. .15 | 800 | 750 | 4.375 | 6936 | 7.05 |
| 8. 8.5 | .250 | .462 | 81.25 | 60.01 | 20.9 |

Problem Practice

For each step write A, S, M, or D. Work the problems.

1. Mr. Jones, who earns \$60 a week, saves .15 of his salary. How much does he save in a year?

2. How many pieces of cloth 3.25 yd. long can be cut from a bolt of cloth 45.5 yd. long?

3. At 16¢ a foot, what will be the cost of a chain 1 ft. 9 in. long?

4. What fractional part of a mile is 88 feet?

5. What decimal part of a mile is 220 yards?

6. How much change should Louise get from \$6 if she buys $2\frac{3}{4}$ lb. of butter at 40¢ a pound?

7. Jane's bedroom is 11.6 feet square. What is the area of the floor?

8. Harold's father drove 285 miles in $9\frac{1}{2}$ hours. What was his average speed per hour?

9. If the railroad fare is $21\frac{1}{5}$ ¢ a mile, how much is the fare for a trip of 336 miles?

10. A family spent \$21.96 for food during a 12-day camping trip. What was the average cost per day?

11. A grocer bought 465 pounds of sugar for \$26. He sold it at 6¢ a pound. How much profit did he make on the sugar?

12. Mr. Adams drove his car 395.7 miles in 8.5 hours. What was the average speed per hour?

13. At 42 cu. ft. to the ton, how many tons of coal are there in a filled bin 14 feet long, 12 feet wide, and 8 feet deep?



Finding Baseball Records

1. The final baseball standings for one of the major leagues in a recent year are given at the right. The record shows the number of games won and lost by each team and the decimal fraction of the games won.

American League

	Won	Lost	Pct.
New York	99	53	.651
Boston	88	61	.591
Cleveland	86	66	.566
Detroit	84	70	.545
Washington	75	76	.497
Chicago	65	83	.439
St. Louis	55	97	.362
Philadelphia	53	99	.349

For each team divide the number of games won by the number played and compare your results with the record.

2. In a series of 14 games, one player was at bat 54 times and made 19 hits. What was his batting average?

Divide the number of hits by the number of times at bat.

$$\begin{array}{r} .3518 \\ 54 \overline{)19.0000} \end{array}$$

His batting average was .352.

3. Find the batting average of each of the players listed at the right. AB stands for *at bat* and H for *hits*.

	AB	H
Di Maggio	508	178
Appling	566	197
Williams	561	193
Radcliff	584	200

Sight Problems

Write the answers.

1. Fred deposits \$1.25 in the bank every week. How much will he have deposited at the end of 10 weeks?
2. John's father bought 10 gallons of gas for \$1.78. What did he pay per gallon?
3. A rod is 16.5 feet. How many feet are there in $\frac{1}{4}$ of a rod?
4. Air weighs about .08 lb. per cubic foot. What is the weight of the air in a room 10 feet long, 10 feet wide, and 10 feet high?
5. A grocer paid 4.9¢ a pound for sugar. How much did he pay for 100 lb.?
6. How much more is 2 feet than $\frac{1}{5}$ of a foot?
7. Mrs. Smith bought a ten-pound turkey for \$2.00. What was the price per pound?
8. A florist bought 1,000 plants for \$20. At this rate, how much did he pay per plant?

Practice in Subtraction

- | | | | | | | | | |
|----|---|---|---|---|--|--|---|------------|
| 1. | $\begin{array}{r} 8.9 \\ 2.9 \\ \hline \end{array}$ | $\begin{array}{r} 9.7 \\ 5.2 \\ \hline \end{array}$ | $\begin{array}{r} 4.0 \\ 1.7 \\ \hline \end{array}$ | $\begin{array}{r} 5.6 \\ .9 \\ \hline \end{array}$ | $\begin{array}{r} 6.4 \\ 4.6 \\ \hline \end{array}$ | $\begin{array}{r} 7.1 \\ .8 \\ \hline \end{array}$ | $\begin{array}{r} 6.8 \\ 5.9 \\ \hline \end{array}$ | 7.1
4.0 |
| 2. | $\begin{array}{r} 4.75 \\ 2.25 \\ \hline \end{array}$ | $\begin{array}{r} 6.03 \\ 4.05 \\ \hline \end{array}$ | $\begin{array}{r} 8.40 \\ 3.90 \\ \hline \end{array}$ | $\begin{array}{r} 7.00 \\ 3.98 \\ \hline \end{array}$ | $\begin{array}{r} 4.61 \\ 1.59 \\ \hline \end{array}$ | 3.01
7.9 | | |
| 3. | $\begin{array}{r} 1.007 \\ .675 \\ \hline \end{array}$ | $\begin{array}{r} 3.002 \\ 1.009 \\ \hline \end{array}$ | $\begin{array}{r} 8.406 \\ 3.097 \\ \hline \end{array}$ | $\begin{array}{r} 6.101 \\ 3.808 \\ \hline \end{array}$ | $\begin{array}{r} 7.125 \\ .834 \\ \hline \end{array}$ | 6.001
1.109 | | |
| 4. | $\begin{array}{r} 7.525 \\ 3.005 \\ \hline \end{array}$ | $\begin{array}{r} 8.242 \\ 2.749 \\ \hline \end{array}$ | $\begin{array}{r} 7.375 \\ 4.125 \\ \hline \end{array}$ | $\begin{array}{r} 1.007 \\ .666 \\ \hline \end{array}$ | $\begin{array}{r} 6.613 \\ .136 \\ \hline \end{array}$ | 8.129
4.009 | | |

Practice in Decimals

Find quotients correct to the nearest hundredth.

- | | | | | | | |
|-----|-----------------------|----------------------|------------------------|-----------------------|----------------------|---------------------|
| 1. | $4\overline{)6.5}$ | $2\overline{)18}$ | $5\overline{)4}$ | $8\overline{)75}$ | $3\overline{)0.27}$ | $7\overline{)39.9}$ |
| 2. | $.6\overline{)4.2}$ | $.8\overline{)9.6}$ | $.4\overline{)24}$ | $.5\overline{)84}$ | $.6\overline{)3.99}$ | $.7\overline{)0.7}$ |
| 3. | $8\overline{)5}$ | $5\overline{)4}$ | $6\overline{)5}$ | $8\overline{)9}$ | $4\overline{)3}$ | $9\overline{)7}$ |
| 4. | $.04\overline{)2.4}$ | $.07\overline{)28}$ | $.08\overline{)72}$ | $.9\overline{)10}$ | $.8\overline{)7.5}$ | |
| 5. | $5\overline{)1.17}$ | $.6\overline{)21.3}$ | $.08\overline{)70.6}$ | $.7\overline{)0.63}$ | $.09\overline{)783}$ | |
| 6. | $10\overline{)935}$ | $10\overline{)98.7}$ | $10\overline{)31.06}$ | $10\overline{)64}$ | $10\overline{)8.05}$ | |
| 7. | $.1\overline{)15}$ | $.1\overline{)3.5}$ | $.01\overline{)6.8}$ | $.02\overline{)22}$ | $.6\overline{)696}$ | |
| 8. | $.18\overline{)72}$ | $.18\overline{)7.2}$ | $.18\overline{)72}$ | $1.8\overline{)0.72}$ | $18\overline{)7.2}$ | |
| 9. | $.008\overline{)6.5}$ | $.004\overline{)95}$ | $.007\overline{)30.9}$ | $.25\overline{)0.56}$ | $4.5\overline{)5.4}$ | |
| 10. | $75\overline{)31}$ | $570\overline{)19}$ | $24\overline{)16}$ | $32\overline{)5}$ | $51\overline{)33}$ | $92\overline{)75}$ |

Change the common fractions below to decimals, correct to the nearest thousandth:

- | | | | | | | | | |
|-----|-----------------|-----------------|----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| 11. | $\frac{3}{4}$ | $\frac{4}{5}$ | $\frac{5}{8}$ | $\frac{6}{7}$ | $\frac{5}{9}$ | $\frac{2}{3}$ | $\frac{5}{6}$ | $\frac{9}{10}$ |
| 12. | $\frac{3}{8}$ | $\frac{5}{4}$ | $\frac{9}{8}$ | $\frac{7}{6}$ | $\frac{5}{3}$ | $\frac{8}{5}$ | $\frac{10}{4}$ | $\frac{9}{5}$ |
| 13. | $\frac{13}{10}$ | $\frac{14}{25}$ | $\frac{5}{16}$ | $\frac{7}{12}$ | $\frac{8}{15}$ | $\frac{9}{32}$ | $\frac{27}{40}$ | $\frac{34}{60}$ |
| 14. | $\frac{11}{15}$ | $\frac{12}{17}$ | $\frac{9}{19}$ | $\frac{15}{22}$ | $\frac{11}{25}$ | $\frac{14}{23}$ | $\frac{25}{35}$ | $\frac{18}{27}$ |

Find the answers for the following. Watch the signs.

- | | |
|-----|--|
| 15. | $7.26 + 84.027 + 38.9 + 956.18 + 3.0748 + .16$ |
| 16. | $8.56 - 3.875 \quad 15 - .667 \quad 29.6 - 2.473 \quad .4483 \div .48$ |
| 17. | $7.09 \times 6.4 \quad 8.3 \times .75 \quad 4.365 \times 2.5 \quad 3.467 \div 8.7$ |
| 18. | $46.9 \div .36 \quad 2.71 \div .007 \quad 3.74 \div .012 \quad 7.85 \div 1.05$ |
| 19. | $100 \times 67.8 \quad 1000 \times .04 \quad 657.8 \div 1000 \quad 10 \times .01$ |

Problem Practice

1. A dairyman sold 12,800 pounds of milk at \$1.00 per hundredweight. How much did he get for the milk?
2. A business corner 45 feet wide and 210 feet deep was sold for \$14,175. How much was this per square foot?
3. A dealer sold $23\frac{3}{4}$ gross of screws at 8¢ a dozen. How much did he receive for the screws?
4. Mrs. Williams drove 119.7 miles at an average speed of 28.5 miles an hour. How long did her trip take?
5. A boy raised four watermelons which weighed 21 lb., $19\frac{3}{8}$ lb., $22\frac{3}{4}$ lb., and $17\frac{5}{8}$ lb. What was the average weight of the watermelons?
6. A year ago Bill weighed 84 lb. He has since gained one-sixth of his weight. How much does he weigh now?
7. Mr. Smith earns $67\frac{1}{2}$ ¢ an hour. When he works 8 hours a day, how much can he earn during a 5-day week?
8. Last September Lucy weighed 59.8 lb. Today she weighs 63.2 lb. How much has she gained?
9. Socks which sell regularly at 50¢ a pair are on sale at 3 pairs for \$1.35. How much would you save if you bought a dozen pairs?
10. One gallon of milk weighs 8.6 pounds. How many gallons are there in a can containing 87.5 pounds of milk? Find the result to the nearest tenth of a gallon.
11. Each block in a certain city is .125 of a mile long. How many blocks are there in a mile?
12. The normal body temperature of a person is 98.6°. A comfortable room temperature is 70°. Find the difference in temperature.

Unit 23, Percentage

The Meaning of Per Cent

You have often heard or read the term **per cent** in such statements as: "Wages have just been raised 5 per cent." "The price of every suit has been reduced 25 per cent." 25 per cent is often written 25%.

The sign % means per cent. **Per cent means hundredths.** $25\% = \frac{25}{100} = .25$. This method of writing hundredths as per cents is called **percentage**.

Read the following per cents. Change them to hundredths. Examples: $4\% = .04$ $18\% = .18$ $10\% = .10 = .1$

1. 35% 16% 20% 10% 11% 1% 6% 9%

2. 50% 90% 17% 98% 100% 7% 3% 5%

3. 12 per cent 75 per cent 2 per cent

4. In a spelling test of 50 words, Fred spelled 90% correctly. How many words did he spell correctly?

The problem tells us that Fred spelled .90, or .9, of 50 words correctly. Think 90% of 50 = $.9 \times 50$. Multiply as in decimals. The answer is 45 words.

50
.9
45.0

Find the following:

5. 50% of \$100 25% of 40 bu. 10% of 150 lb.

6. 35% of \$250 18% of 75 mi. 75% of 160 A.

7. 4% of \$300 27% of 1200 95% of 500 yd.

8. 8% of \$500 15% of 4500 51% of 400 bu.

Problem Practice

For each step write A, S, M, or D. Work the problems.

1. Mr. Holt earns \$60 a week and saves 25% of it. How much does he save each week?
2. Mrs. Smith bought 16 yards of cloth to make towels. How many towels, each 24 inches long, can she cut from this cloth?
3. George had 110 marbles. He gave away 40% of his marbles. How many marbles did he have left?
4. Mr. Wilson, whose yearly income is \$1800, spends 20% for rent. How much money does he spend for rent?
5. At \$4.90 per hundredweight, what will 978 pounds of sugar cost?
6. Of the ten problems in her test, Ruth got 80% correct. How many of the problems did she get correct?
7. Mrs. Edwards bought a \$35 suit on sale at a reduction of 25%. How much did she pay for the suit?
8. Mr. Simpson's speedometer registered 7492 miles when he started on a trip and 8234 miles when he returned. He used 53 gallons of gasoline. How many miles per gallon did his car travel?
9. At \$12 per ton, what do 3500 lb. of coal cost?
10. If the rate for sending a telegram is 72 cents for the first 10 words and 5 cents for each additional word, what did Betty pay for a 23-word telegram?
11. What is the perimeter of a rectangular lot 206.6 ft. long and 213.5 ft. wide?
12. John worked $2\frac{1}{2}$ hours on Saturday, 45 minutes on Wednesday, and $\frac{1}{2}$ hour on Friday. If he was paid 20¢ an hour, how much money did he receive?

Changing Per Cents to Decimals

1. Mrs. Ellis bought a pair of \$3.50 shoes on sale at 15% off the regular price. What was the reduction?

Find 15% of \$3.50. Change 15% to .15. Think 15% of \$3.50 = $.15 \times \$3.50$. The product is \$.525. Although \$.525 would usually be rounded off to \$.53, the store probably reduced the price by only \$.52, counting the half cent in its favor.

\$3.50
.15
1750
350
\$.5250

To change a per cent to a decimal, move the decimal point two places to the left.

Explain how the per cents below are changed to decimals:

- | | |
|--------------------------------------|----------------------------------|
| 1. $1\frac{1}{2}\% = 1.5\% = .015$ | $1\% = \frac{1}{100} = .01$ |
| 2. $10\frac{1}{2}\% = 10.5\% = .105$ | $100\% = \frac{100}{100} = 1$ |
| 3. $5\frac{1}{4}\% = 5.25\% = .0525$ | $150\% = \frac{150}{100} = 1.5$ |
| 4. $\frac{1}{2}\% = .5\% = .005$ | $275\% = \frac{275}{100} = 2.75$ |
| 5. $2\frac{3}{4}\% = 2.75\% = .0275$ | $27\% = \frac{27}{100} = .27$ |

Change the following per cents to decimals:

- | | | | | | |
|---------------------|------------------|------------------|-------------------|------|------|
| 7. 9% | $7\frac{1}{2}\%$ | $4\frac{1}{4}\%$ | $12\frac{1}{2}\%$ | 110% | 105% |
| 8. $6\frac{1}{4}\%$ | 3.5% | $1\frac{3}{4}\%$ | 11.5% | 205% | 250% |

Find the following, correct to the nearest cent:

- | | | |
|--------------------------------|-----------------------------|----------------------------|
| 9. 6% of \$8.75 | 14% of \$7.45 | 108% of \$125 |
| 10. 3% of \$5.35 | 82% of \$9.10 | 130% of \$6.50 |
| 11. $2\frac{1}{2}\%$ of \$3.60 | $18\frac{1}{2}\%$ of \$6.72 | 325% of \$9.28 |
| 12. $8\frac{3}{4}\%$ of \$4.20 | 26% of \$1.85 | 204% of \$785 |
| 13. $3\frac{1}{2}\%$ of \$1500 | 40% of \$8.25 | 175% of \$500 |
| 14. $5\frac{1}{2}\%$ of \$100 | 2% of \$1000 | $12\frac{1}{2}\%$ of \$450 |

Test #	1	2	3	4	5
Problems	20	25	10	20	25
Mary	80%	88%	90%	95%	84%
John	70%	76%	70%	60%	80%
Helen	90%	92%	100%	85%	96%
George	85%	84%	80%	90%	92%

Using Per Cents in Tests

Mary was writing on the board the test scores of four pupils in last month's problem tests.

1. How many problems were there in the five tests?
2. How many of the problems did Mary, John, Helen, and George have correct in the first test? in the second test? in the third test? in the fourth test? in the fifth test?
3. How many problems did Mary have correct in all five of the tests? John? Helen? George?
4. What per cent of all the problems did Mary have correct? John? Helen? George?
5. Keep a record of your grades on tests to see whether your grades improve from month to month. Find your average grade on the tests you have taken.

Changing Per Cents to Fractions

A per cent may be changed to three other forms of equal value, as: $25\% = .25 = \frac{25}{100} = \frac{1}{4}$.

Write each of the following in three other forms:

1. 50% 25% 75% 20% 40% 60%
2. 10% 30% 70% 90% 5% 15%

In many cases it is easier to use the fractional value, as: 25% of 24 = $\frac{1}{4} \times 24 = 6$.

In the following examples change the per cent to a fraction and multiply:

1. 50% of 18 25% of 12 75% of 8 10% of 30
2. 20% of 15 75% of 16 40% of 10 50% of \$6
3. 25% of 120 20% of 100 50% of 32 60% of 35
4. 80% of 45 10% of 150 5% of 40 4% of 50

Problems

1. The distance around a tree trunk is 3.14 times its thickness. What is the thickness of a tree trunk that measures 6.5 feet around?
2. A \$60 coat was reduced 25%. What was the selling price?
3. How many acres are there in a field that is 80 rods by 160 rods?
4. An agent sold a house and lot for \$8,000 and received 5% of the sale price for his services. How much did the owner receive?
5. A team played 15 games and won $33\frac{1}{3}\%$ of them. How many games did this team win?

Problem Practice

For each step write A, S, M, or D. Work the problems.

1. Mrs. Weber paid 32¢ for $\frac{1}{4}$ yard of goods. How much would one yard have cost?

2. Bob's father is making a bookcase in which the shelves are $3\frac{1}{2}$ ft. long. How many feet of board does he need for 6 such shelves?

3. Clara's mother used $5\frac{1}{3}$ yd. of cloth to make four aprons. How much did she use for 1 apron?

4. A family having a yearly income of \$3200 spent 18% for food and 16% for clothing. How much was spent for food and clothing?

Fractions, Decimals, and Per Cents

Practice until you can write from memory the fraction for each of these commonly used per cents:

- | | | | |
|-------------------------|-----------------------|---------------------------------|---------------------------------|
| 1. $50\% = \frac{1}{2}$ | $60\% = \frac{3}{5}$ | $90\% = \frac{9}{10}$ | $33\frac{1}{3}\% = \frac{1}{3}$ |
| 2. $25\% = \frac{1}{4}$ | $80\% = \frac{4}{5}$ | $12\frac{1}{2}\% = \frac{1}{8}$ | $66\frac{2}{3}\% = \frac{2}{3}$ |
| 3. $75\% = \frac{3}{4}$ | $10\% = \frac{1}{10}$ | $37\frac{1}{2}\% = \frac{3}{8}$ | $16\frac{2}{3}\% = \frac{1}{6}$ |
| 4. $20\% = \frac{1}{5}$ | $30\% = \frac{3}{10}$ | $62\frac{1}{2}\% = \frac{5}{8}$ | $5\% = \frac{1}{20}$ |
| 5. $40\% = \frac{2}{5}$ | $70\% = \frac{7}{10}$ | $87\frac{1}{2}\% = \frac{7}{8}$ | $4\% = \frac{1}{25}$ |

Change the following to decimals. Example: $\frac{1}{2} = .50$

- | | | | | | | |
|------------------|----------------|----------------|-----------------|----------------|-----------------|----------------|
| 6. $\frac{1}{2}$ | $\frac{1}{3}$ | $\frac{1}{4}$ | $\frac{1}{5}$ | $\frac{1}{6}$ | $\frac{1}{8}$ | $\frac{2}{3}$ |
| 7. $\frac{2}{5}$ | $\frac{4}{5}$ | $\frac{1}{10}$ | $\frac{3}{10}$ | $\frac{7}{10}$ | $\frac{9}{10}$ | $\frac{3}{8}$ |
| 8. $\frac{7}{8}$ | $\frac{1}{25}$ | $\frac{1}{50}$ | $\frac{1}{20}$ | $\frac{3}{20}$ | $\frac{6}{25}$ | $\frac{7}{20}$ |
| 9. $\frac{3}{5}$ | $\frac{5}{6}$ | $\frac{9}{20}$ | $\frac{17}{20}$ | $\frac{4}{25}$ | $\frac{16}{25}$ | $\frac{3}{50}$ |

Unit 24. Percentage

Fractions and Per Cents

To change a fraction to a per cent, change it to a decimal and then to a per cent. Explain each step.

1. $\frac{1}{2} = .50 = 50\%$ $\frac{2}{3} = .66\frac{2}{3} = 66\frac{2}{3}\%$ $\frac{1}{3} = .33\frac{1}{3} = 33\frac{1}{3}\%$
 2. $\frac{1}{4} = .12\frac{1}{2} = 12\frac{1}{2}\%$ $1\frac{1}{4} = 1.25 = 125\%$ $1\frac{1}{2} = 1.50 = 150\%$

Change the following to per cents:

- | | | | | | | | |
|-------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| 3. $\frac{1}{4}$ | $\frac{1}{6}$ | $\frac{3}{4}$ | $\frac{3}{8}$ | $\frac{5}{6}$ | $\frac{1}{3}$ | $\frac{1}{5}$ | $\frac{4}{5}$ |
| 4. $\frac{5}{8}$ | $\frac{7}{8}$ | $\frac{3}{10}$ | $\frac{3}{5}$ | $\frac{7}{10}$ | $\frac{2}{5}$ | $\frac{9}{10}$ | $\frac{1}{12}$ |
| 5. $\frac{1}{16}$ | $\frac{1}{20}$ | $\frac{1}{25}$ | $\frac{1}{50}$ | $\frac{3}{25}$ | $\frac{3}{20}$ | $\frac{7}{25}$ | $\frac{4}{10}$ |
| 6. $1\frac{1}{2}$ | $2\frac{1}{4}$ | $1\frac{1}{8}$ | $1\frac{1}{3}$ | $1\frac{2}{3}$ | $2\frac{1}{5}$ | $1\frac{3}{4}$ | $1\frac{7}{8}$ |

Change the per cents below to decimals and then to common fractions reduced to their lowest terms:

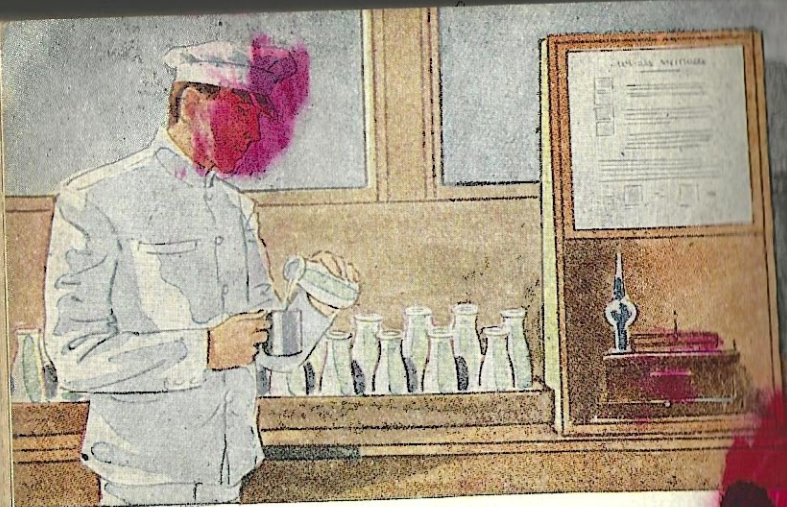
- | | | | | | |
|---------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| 7. 1% | 50% | 25% | 75% | 20% | 30% |
| 8. 5% | 4% | 45% | 80% | 70% | $12\frac{1}{2}\%$ |
| 9. $8\frac{1}{3}\%$ | $37\frac{1}{2}\%$ | $62\frac{1}{2}\%$ | $87\frac{1}{2}\%$ | $66\frac{2}{3}\%$ | $16\frac{2}{3}\%$ |
| 10. 15% | 90% | 96% | 84% | 16% | 56% |

Change the per cents below to decimals and then to mixed numbers:

- | | | | | |
|----------|------|--------------------|--------------------|--------------------|
| 11. 140% | 250% | 110% | $112\frac{1}{2}\%$ | $116\frac{2}{3}\%$ |
| 12. 180% | 175% | $162\frac{1}{2}\%$ | $133\frac{1}{3}\%$ | $166\frac{2}{3}\%$ |

Change the following decimals to per cents:

- | | | | | | | |
|---------|------|------|------------------|------|------|------|
| 13. .1 | .01 | 1.1 | .10 | .15 | .015 | 1.5 |
| 14. .5 | .05 | .50 | 2.5 | .25 | .025 | .225 |
| 15. .37 | 3.75 | .375 | $.33\frac{1}{3}$ | .085 | .55 | .055 |



Some Practical Uses for Per Cent

Per cents are used in many ways on the farm and in the city. Work the following problems:

1. A certain dairy got, on an average, 4% of butter fat from its milk. How many pounds of butter fat did it get from 2800 lb. of milk?

2. Last year Mr. Brown got a yield of 950 bu. of corn from 40 acres. This year he got an increase of 8%. How many bushels of corn did he get for both years?

3. Mr. Smith found that the price of wheat had risen 10% over that of the previous month. He had received \$.90 a bushel. What did he get after the change in price?

4. A farmer found that, on the average, 80% of his eggs hatched. How many chickens would he expect to hatch from 360 eggs?

5. Mr. Jones paid an income tax of 4.4% on \$2500 of his income. What was his tax?

6. In 1790 3% of the 3,900,000 people in the United States lived in cities, but in 1930 56% of the population of 122,775,000 were city dwellers. About how many lived in cities in 1790 and in 1930?

Per Cents, Decimals, and Fractions

1. Fred saved \$4.50 but spent 100% of the money for a pair of roller skates. How much did he spend? How much money did he have after buying them?

$$100\% = \frac{100}{100} = 1$$

100% means all.

Think 100% of \$4.50 = $1 \times \$4.50$.

2. Explain 200% of \$4.50 = $2 \times \$4.50$.

3. Find 150% of \$4.50.

Multiply \$4.50 by 1.5. Then multiply \$4.50 by $1\frac{1}{2}$ and compare the answers.

$$150\% = 1.5 = 1\frac{1}{2}$$

Change the following to whole numbers, fractions, or mixed numbers. Example: $120\% = 1.2 = 1\frac{1}{5}$

- | | | | | | |
|----------------------|--------------------|-------------------|--------------------|-------------------|--------------------|
| 4. 25% | 125% | 75% | 175% | 10% | 100% |
| 5. 20% | 200% | 50% | 250% | 300% | 500% |
| 6. 60% | 160% | 140% | 120% | 180% | 350% |
| 7. $33\frac{1}{3}\%$ | 40% | 400% | 420% | $12\frac{1}{2}\%$ | $112\frac{1}{2}\%$ |
| 8. 4% | $133\frac{1}{3}\%$ | $66\frac{2}{3}\%$ | $166\frac{2}{3}\%$ | $62\frac{1}{2}\%$ | $162\frac{1}{2}\%$ |

Change the following per cents to fractions or mixed numbers. Find the results.

- | | | | |
|-----------------------------|-----------|-------------------------|--------------------------|
| 9. 25% of 8 | 20% of 15 | 4% of 25 | 10% of 20 |
| 10. 5% of 60 | 30% of 50 | $12\frac{1}{2}\%$ of 16 | $33\frac{1}{3}\%$ of 6 |
| 11. $37\frac{1}{2}\%$ of 24 | 80% of 30 | $8\frac{1}{3}\%$ of 36 | $66\frac{2}{3}\%$ of 9 |
| 12. 125% of 16 | 5% of 120 | 160% of 20 | 120% of 15 |
| 13. $133\frac{1}{3}\%$ of 6 | 75% of 28 | 150% of 10 | $187\frac{1}{2}\%$ of 14 |
| 14. 40% of 75 | 90% of 40 | $16\frac{2}{3}\%$ of 42 | 50% of 9 |
| 15. 175% of 12 | 15% of 20 | 250% of 30 | $112\frac{1}{2}\%$ of 8 |
| 16. 10% of 45 | 75% of 15 | 50% of 25 | $33\frac{1}{3}\%$ of 16 |

Family Budgets

Many families make a plan, or **budget**, for spending the yearly income. Below are four budgets for four different incomes. The table shows the per cent of each income to be spent for each item in the budget.

Annual Income	Food	Rent	Clothing	Operating	Advancement	Other
\$1800	32%	25%	15%	10%	12%	4%
\$2400	26%	24%	15%	12%	13%	10%
\$3000	24%	22%	15%	12%	15%	12%
\$3600	20%	21%	16%	13%	16%	14%

Operating expenses include such expenses as light, heat, telephone, laundry, repairs, and supplies. Advancement includes health, recreation, church, charity, life insurance, education, papers, books, and magazines.

1. Add the per cents in each of the four lines in the table. Why should these sums be equal?

2. As the income increases, which per cents in the budget become larger? Which per cents become smaller?

3. Using the per cents in the table above, make a table showing the amount of money allowed annually for each item in the budget for each of the four incomes. Your table should show dollars instead of per cents. For example, the amount allowed for food is 32% of \$1800, or \$576.

4. Find the monthly allowance for each item for an annual income of \$3600.

5. Find the monthly allowance for each item for an annual income of \$2400.

6. What are some advantages of a family budget?

Finding What Per Cent One Number Is of Another

1. In a test of 25 words, Edith spelled 23 words correctly. What per cent of the 25 did she spell correctly?

Think $23 = \frac{23}{25}$ of 25. Change $\frac{23}{25}$ to a decimal and then to a per cent in exactly the same way that you change any fraction to a per cent.

The answer is 92%. Proof: $92 \times 25 = 23$.

$$\begin{array}{r} .92 = 92\% \\ 25 \overline{)23.00} \\ \underline{22 \ 5} \\ 50 \\ \underline{50} \\ 0 \end{array}$$

2. An overcoat that sold regularly for \$30 was placed on sale at \$24. What per cent was the price of the overcoat reduced?

$$\$30 - \$24 = \$6 \text{ (reduction). } 6 \div 30 = \frac{6}{30} = \frac{1}{5} = 20\%$$

3. A team won 11 of the 16 games it played. What per cent of its games did the team win?

$$\frac{11}{16} = 11 \div 16 = .6875 \text{ or } .688 = 68.8\%$$

4. In an arithmetic test of 20 problems, Roy got 19 right; May, 16; Tom, 18; and Mary, 20. What per cent of the problems did each solve correctly?

In the following pairs of numbers, what per cent is the second number of the first?

5. 16	4	25	5	18	9	24	8
6. 15	6	16	2	35	7	8	6
7. 24	18	36	9	40	15	75	30
8. 80	10	64	56	60	40	12	10
9. 50	19	25	7	18	3	27	18
10. 60	3	40	12	30	5	45	18
11. 15	9	15	12	25	20	80	32

Problem Practice

For each step write A, S, M, or D. Work the problems.

1. A farmer sold $7\frac{1}{2}$ gallons of milk at 12¢ a quart. How much did he receive for the milk?
2. A rectangular lot has a width of $6\frac{1}{2}$ rods and a length of $7\frac{1}{2}$ rods. How many square yards does it contain?
3. How many handkerchiefs 12 inches square can Ruth cut from one square yard of material?
4. At 36¢ a pound, what is the cost of $3\frac{1}{4}$ pounds of ham?
5. Fred weighed $92\frac{3}{4}$ pounds last fall, and now he weighs $101\frac{1}{8}$ pounds. How much has he gained?
6. Jane's mother bought 6.5 yards of material for \$3.38 at a sale. How much did she save if the regular price was 70¢ per yard?
7. A basement is 32 ft. by 24 ft. by 6 ft. How many cubic yards of dirt were removed in digging it?
8. Mrs. Anderson bought a tire for her automobile. The price was \$11.60, but the dealer allowed her 25% off the price for her old tire. How much did Mrs. Anderson pay?
9. Tom bought four \$1.50 shirts which were on sale at 25% off the regular price. How much did he pay for them?
10. When a suit has been reduced from \$25 to \$23, what per cent reduction has been made?
11. A man whose monthly salary is \$300 paid \$600 a year for rent. What per cent of his monthly salary was left?
12. A dealer bought an automobile for \$1200 and then sold it for \$1500. What per cent of the selling price was his gain?
13. What per cent of an hour is 20 minutes?

Sixth Self-Test

Test What You Have Learned

1. Find each per cent in row A of each number in B.

A	10%	18%	72%	6%	45%
B	45	250	8	9.42	85.7

2. Find each per cent in row A of each number in B.

A	$2\frac{1}{2}\%$	$5\frac{1}{4}\%$	$33\frac{1}{3}\%$	125%	4.5%
B	25	16	4.64	75	500

3. Each number in row A is what per cent of each number in row B?

A	9	4	12	15	7	5	16
B	20	18	24	36	45	70	50

4. Divide each number in row A by each in row B.

A	5.72	17.9	.756	8.7	10.06
B	2.5	3.16	.105	.68	12

Find the answers for the following. Watch the signs.

- | | | | |
|-------------------------------------|---------------------------------------|-------------------------------------|---------------------------------------|
| 5. $2\frac{1}{2} \div 6\frac{5}{8}$ | 6. $2\frac{1}{2} \times 3\frac{3}{4}$ | 7. $3\frac{1}{2} \div 1\frac{3}{4}$ | 8. $4\frac{7}{10} - 2\frac{3}{5}$ |
| 9. $6\frac{1}{8} \div 1\frac{1}{2}$ | 10. $4\frac{5}{8} \div 2\frac{2}{3}$ | 11. $5\frac{1}{2} - 1\frac{7}{8}$ | 12. $5\frac{2}{3} \times \frac{4}{5}$ |
| 13. $4\frac{1}{4} \times 5$ | 14. $3\frac{1}{3} - 2\frac{5}{8}$ | 15. $2\frac{3}{4} \div \frac{1}{2}$ | 16. $4\frac{3}{4} \div 2\frac{2}{3}$ |
| 17. $8 \div 5\frac{1}{4}$ | 18. $6\frac{3}{5} + 2\frac{2}{3}$ | 19. $8\frac{3}{4} - 2\frac{2}{5}$ | 20. $\frac{2}{3} \times 4\frac{7}{8}$ |

Problem Test

1. If a man earns \$250 a month and saves 15% of his salary, how much does he save each month?
2. In a spelling test of 50 words Mary spelled 90 per cent of the words correctly. How many words did she not spell correctly?
3. The base of a triangle is 15 ft., and the altitude is 12 ft. How many square yards are there in the triangle?
4. At 15.2 miles per gallon, how far will an automobile travel on 5 gallons of gasoline?
5. A farmer sold 8790 pounds of wheat at 87 cents a bushel. How much did he get for the wheat? (1 bu. of wheat = 60 lb.)
6. The perimeter of a three-sided piece of land is 304 feet. One side is $102\frac{1}{2}$ feet and another side is $89\frac{1}{2}$ feet. How long is the third side?
7. Roy worked for \$15 per week. He received a raise of \$2.25 per week. What per cent increase was this?
8. Mary bought 4 pounds of sugar at $6\frac{1}{2}$ ¢ a pound, 1 dozen oranges at 60¢ a dozen, and $1\frac{3}{4}$ pounds of steak at 48¢ a pound. What was her change from \$5?
9. An automobile ran 225.9 miles on 18 gallons of gasoline. At this rate, how many gallons would it require for a season's run of 7825 miles?
10. The printed part of a certain page is $5\frac{3}{4}$ in. by 5 in. How many square inches are there in the printed part?
11. A basketball team played 20 games and won 70% of them. How many games did it win?
12. At \$4.50 per day, how long will it take a man to earn \$58.50?



Unit 25. Using Percentage

Finding Discounts and Sale Prices

Bob saw an advertisement in the paper that read as follows: "Save by buying sporting goods now for next season. Prices cut 15% to 50%. Come in early."

1. Bob wanted to buy a pair of skis that had sold for \$6.80. He read that the discount on skis was 35%. Find the discount and the sale price.

What is the regular price of the skis? How do you find the discount? the sale price? Change 35% to .35. $.35 \times \$6.80 = \$2.38$, the discount. $\$6.80 - \$2.38 = \$4.42$, the sale price.

2. Ruth bought a camera, marked \$15, at a discount of 25%. Find the discount and the sale price.

3. A stop watch marked \$27.50 was sold at 25% off the marked price. Find the sale price of the stop watch.

4. Find advertisements of goods being sold at discounts from the regular prices and use them to make problems in finding discounts and sale prices.

The regular prices and the discount rates on certain articles are given below. Find the sale prices.

5. Fishing rod..	\$4.50	16 $\frac{2}{3}$ %	Sled.....	\$5.75	33 $\frac{1}{3}$ %
6. Rowboat....	\$24.90	15%	Skates.....	\$4.25	25%
7. Camp tent..	\$11.45	20%	Reel.....	\$4.95	25%
8. Camp stove..	\$7.60	40%	Bicycle..	\$29.50	12 $\frac{1}{2}$ %

Practice in Fractions

Add:

$$1. \begin{array}{r} 3\frac{3}{4} \\ 4\frac{5}{8} \end{array} \quad \begin{array}{r} 5\frac{2}{3} \\ 3\frac{7}{12} \end{array} \quad \begin{array}{r} 2\frac{5}{6} \\ 4\frac{1}{2} \end{array} \quad \begin{array}{r} 5\frac{7}{8} \\ 2\frac{1}{2} \end{array} \quad \begin{array}{r} 4\frac{2}{3} \\ 3\frac{5}{6} \end{array} \quad \begin{array}{r} 7\frac{5}{12} \\ 4\frac{1}{6} \end{array}$$

$$2. \begin{array}{r} 2\frac{1}{2} \\ 1\frac{2}{3} \end{array} \quad \begin{array}{r} 4\frac{3}{4} \\ 2\frac{1}{3} \end{array} \quad \begin{array}{r} 5\frac{1}{2} \\ 3\frac{2}{5} \end{array} \quad \begin{array}{r} 6\frac{3}{8} \\ 4\frac{1}{3} \end{array} \quad \begin{array}{r} 1\frac{3}{4} \\ 2\frac{4}{5} \end{array} \quad \begin{array}{r} 6\frac{3}{8} \\ 4\frac{2}{3} \end{array}$$

Subtract:

$$3. \begin{array}{r} 4 \\ 1\frac{5}{8} \end{array} \quad \begin{array}{r} 3 \\ 1\frac{7}{12} \end{array} \quad \begin{array}{r} 5 \\ 3\frac{4}{5} \end{array} \quad \begin{array}{r} 3\frac{3}{4} \\ 2\frac{1}{4} \end{array} \quad \begin{array}{r} 4\frac{5}{8} \\ 2\frac{1}{8} \end{array} \quad \begin{array}{r} 6\frac{1}{4} \\ 3\frac{1}{4} \end{array}$$

$$4. \begin{array}{r} 5\frac{3}{8} \\ 2\frac{5}{8} \end{array} \quad \begin{array}{r} 6\frac{3}{4} \\ 3\frac{1}{2} \end{array} \quad \begin{array}{r} 4\frac{7}{8} \\ 2\frac{1}{2} \end{array} \quad \begin{array}{r} 4\frac{1}{3} \\ 1\frac{5}{6} \end{array} \quad \begin{array}{r} 7\frac{3}{4} \\ 4\frac{7}{8} \end{array} \quad \begin{array}{r} 10\frac{1}{4} \\ 5\frac{1}{6} \end{array}$$

Problems

1. A farmer harvested 470 bu. of wheat from a field 40 rd. by 120 rd. What was the average yield per acre?

2. How many square feet are there in a triangle with a base of $7\frac{1}{2}$ feet and an altitude of 5 feet?

3. Find the total cost of 6 yd. gingham @ 27¢, 8 yd. silk @ \$1.65, 6 yd. rayon @ 85¢, 4 yd. velvet @ \$3.40, and 12 spools thread @ 10¢.

4. Mr. Law's salary has been raised to 120% of his former salary of \$150 a month. What is it now?

5. A piano company advertised all its pianos at a $33\frac{1}{3}\%$ discount from the regular prices. What is the sale price of a piano marked \$324?

6. A man bought furniture for \$385. He paid \$100 cash and the rest at the rate of \$20 per month. How long did it take him to pay for the furniture?

Buying at Sale Prices

1. The advertisement shown below appeared recently in a large city paper. On your paper write the sale prices for the items in the advertisement.

STERLING SILVER

At Reductions of 20% to 50% from Regular Prices

6 teaspoons.....	\$10.50	30% off
6 dessert spoons.....	19.50	35% off
6 dinner knives.....	22.50	20% off
6 dinner forks.....	26.50	20% off
6 salad forks.....	17.50	35% off
6 cocktail forks.....	12.00	25% off

Many Other Items at Great Savings

Find the results for the following, correct to the nearest cent:

25% of \$5.98	15% of \$3.75	$33\frac{1}{3}\%$ of \$2.85
$5\frac{1}{2}\%$ of \$7.48	$3\frac{1}{3}\%$ of \$4.50	$12\frac{1}{2}\%$ of \$6.25
16% of \$2.80	45% of \$9.20	$16\frac{2}{3}\%$ of \$4.00

Shirts sold regularly at the prices given below were put on sale at 25% discount. Find the sale price and the amount saved on each of these shirts:

5. \$2.50	\$1.75	\$4	\$5	\$3.00
6. \$2	\$1.60	\$1.80	\$1.40	\$1.35
7. \$1.20	\$3.50	\$2.85	\$2.25	\$4.20

In August, summer hats were offered at 50% off the regular prices. Find the sale price for each regular price given below:

8. \$8.00	\$7.50	\$6.00	\$5.75	\$3.25
9. \$5.00	\$5.50	\$4.50	\$4.00	\$9.10
10. \$7.75	\$3.50	\$2.50	\$4.35	\$6.45

25.00
55.00
\$30.00

Problems in Discount

For each step write A, S, M, or D. Work the problems.

1. A \$3 book was sold to dealers at a discount of 40%. What was the price to the dealers?

2. Tom's mother bought a set of dishes marked \$10 and a dozen glasses marked \$5.50. How much did she pay if the dealer reduced the price by 20%?

3. Mrs. Jones bought a table marked \$25 at a discount of 25%. How much did she pay for the table?

4. A \$120 rug and six \$7.50 chairs were bought at a 20% discount. What was paid for these goods?

5. A salesman bought a car for \$1200 less a discount of 18%. After using it for one season, he sold it for \$125 less than it had cost him. For how much did he sell it?

6. A suit marked \$28.50 was sold at a special discount of 33 $\frac{1}{3}$ %. For how much was it sold?

7. What was the per cent of reduction on a chair marked \$7.50 and sold for \$6.00?

8. Shoes marked \$4.50 were sold at a monthly sale for 20% off. How much did the buyer save on each pair?

9. If an automobile that was priced at \$1200 was sold to a retail dealer for \$840, what per cent of discount was allowed from the original price?

10. A dealer sold 75 yd. of goods costing 60¢ a yd. at a discount of 8%. What did he receive for the goods?

11. A rug marked \$52, 6 chairs marked \$8 each, and a table marked \$44 were bought at a discount of 12%. How much did the buyer save?

Mixed Practice

1. Add each number in row A to each number in B.

A	$10\frac{3}{4}$	$15\frac{7}{8}$	$14\frac{5}{8}$	$18\frac{1}{3}$	$13\frac{1}{2}$	$17\frac{1}{4}$
B	$4\frac{1}{2}$	$3\frac{3}{4}$	$7\frac{5}{6}$	$8\frac{3}{4}$	$6\frac{2}{3}$	$9\frac{7}{8}$

2. Subtract each number in B from each number in A.

Find the answers for the following. Watch the signs.

3. $\frac{3}{4} \div \frac{4}{5}$ $12 \div 1\frac{1}{3}$ $\frac{3}{4} \div 1\frac{1}{2}$ $6 \div 2\frac{1}{2}$

4. $1\frac{1}{2} \times 2\frac{1}{2}$ $4\frac{7}{8} \times 3$ $4\frac{7}{8} \times 4$ $3\frac{1}{3} \times 2\frac{1}{2}$ $9\frac{1}{2} \times 3\frac{1}{3}$ $3\frac{3}{4} \times 2\frac{3}{8}$ $2\frac{5}{8} \times 1\frac{1}{3}$

5. $\frac{5}{6} \div 3$ $\frac{2}{3} \div 4$ $7\frac{1}{2} \div 3$ $16\frac{2}{3} \div 8\frac{1}{3}$

Divide the following. Find answers correct to two decimal places.

6. $35 \div 5$ $3.5 \div 5$ $.35 \div .5$ $35 \div .05$

7. $1.4 \overline{)6.52}$ $6.7 \overline{)8.9}$ $9.4 \overline{)6.57}$ $12.5 \overline{)30.76}$

8. $15 \div 17$ $51.2 \div 67$ $87 \div 9.8$ $842 \div 5.6$

Change the following per cents to decimals:

9. 1% 7% 9% 2% 15% 2 $\frac{1}{2}$ %

10. 3% 8 $\frac{1}{2}$ % 4 $\frac{1}{4}$ % 12% 12 $\frac{1}{2}$ % $\frac{1}{2}$ %

11. 1 $\frac{1}{4}$ % 3 $\frac{1}{4}$ % 2 $\frac{3}{4}$ % 7 $\frac{3}{4}$ % 15 $\frac{1}{4}$ % .5%

12. 20% 30% 40% 17% 100% 125%

13. 12.5% 24% 37 $\frac{1}{2}$ % 4.5% 8.3% 350%

14. 6.8% 6 $\frac{1}{4}$ % 62 $\frac{1}{2}$ % 12 $\frac{1}{4}$ % 137 $\frac{1}{2}$ % 10.5%

Change the following per cents to fractions:

15. 10% 25% 75% 50% 30% 1%

16. 80% 87 $\frac{1}{2}$ % 6 $\frac{1}{4}$ % 33 $\frac{1}{3}$ % 66 $\frac{2}{3}$ % 8 $\frac{1}{3}$ %

Problem Practice

For each step write A, S, M, or D. Work the problems.

1. Arthur wants to buy a knife that costs \$1.50. He has 75¢ and earns 15¢ each Saturday. How many weeks will it take him to earn enough to buy the knife?

2. Find the cost of $\frac{3}{4}$ lb. candy at 60¢ a pound, $2\frac{1}{2}$ lb. cheese at 28¢ a pound, $1\frac{3}{4}$ lb. bacon at 16¢ a pound, and $1\frac{1}{2}$ lb. steak at 45¢ a pound.

3. At \$1.15 a bushel, what do 8 bu. of peaches cost?

4. Traveling at the rate of 45.5 miles per hour, how many hours did a train take to cover 245.7 miles?

5. What do $3\frac{1}{8}$ yd. of ribbon cost at 40¢ a yard?

6. My brother is 5 ft. 9 in. tall, and my sister is 4 ft. 11 in. tall. How much taller is my brother?

7. Shirts that used to sell at \$1.25 were increased to \$1.50. What was the per cent of increase?

8. A merchant found that, of all the money he received from sales, 65% went for the cost of the goods and 25% for the cost of doing business. What per cent of his sales was profit?

9. One suit marked \$36 was reduced 25%. Another marked \$35 was reduced $\frac{1}{5}$. The sale price of the first suit was how much lower than the sale price of the second?

10. At 80¢ a pound, what will $4\frac{3}{4}$ lb. of candy cost?

11. If there are 38 cu. ft. to the ton, how many tons of coal are there in a bin 19 ft. by 16 ft. in which the coal is 7 ft. deep?

12. A box is 16 in. long, 10 in. wide, and $2\frac{1}{2}$ in. deep. How many cubic inches does it hold?

Unit 26. Percentage

Selling on Commission

Jack delivers afternoon papers on his regular paper route. Besides the money he earns for delivering papers, he gets a commission of 15 per cent on all new subscriptions he takes.



1. A yearly subscription to a daily paper costs \$6. At 15% commission, how much does Jack receive on two new yearly subscriptions?

$$\begin{aligned} 2 \times \$6 &= \$12 \\ .15 \times \$12 &= \$1.80 \end{aligned}$$

2. After paying Jack 15% commission on \$12, how much of this money should the company receive?

Commission is the per cent of sales paid to an agent for selling. The difference between the amount of the sales and the commission is called the **net proceeds**.

3. Last summer Jack brought in \$56 in new subscriptions. At 15%, what was his commission?

4. Last summer Jack's brother, Walter, took subscriptions for a \$3.50 magazine. At 20% commission, how much did he receive for 45 subscriptions?

5. Mr. Bishop sells real estate on commission. He sold a house for \$8750. At 5%, what was his commission for selling the house?

6. Dan's father pays him 25% on all sales at their roadside stand. One month Dan sold \$67.50 worth of vegetables. What was his commission? What were the net proceeds of his sales?

Problem Practice

For each step write A, S, M, or D. Work the problems.

1. An agent sold a house for \$12,500 and received a commission of 5%. How much did the owner receive?
2. Tom's father bought a \$1200 automobile at a discount of 12%. How much did he save?
3. An agency charged 15% commission for collecting a debt of \$1400. How much did they get for their services?
4. Mr. Wilson's salary is \$220 per month. By saving 25% of his salary, how much can he save in a year?
5. How many gallons does a tank hold if it is 1 ft. 10 in. long, 1 ft. wide, and 1 ft. 2 in. deep? (1 cu. ft. holds 7.5 gal.)
6. A dealer bought 6 automobiles at \$555 each and sold them for \$842 each. His expenses for each sale were \$75. How much did he make on the total sale?
7. A town of 1600 inhabitants gained 12% in population during a five-year period. What was its total population then?
8. Mr. Brown pays \$50 a month for rent. What per cent of his annual salary of \$3000 does he pay for rent?
9. The price of a book was reduced from \$1.50 to \$1.25. What was the per cent of reduction?
10. A merchant sold 50 bu. of potatoes at \$2 per bushel. He charged 15% commission. How much did he earn?
11. Mary helps her uncle Saturdays in his candy store. She is paid 15% commission on her sales. Last week she sold \$12.35 worth of candy. How much did she earn?
12. Ed sold 25 subscriptions to a \$1.50 magazine at a commission of 25%. How much did he earn?

Finding Interest

1. Mr. Wells borrowed \$3,000 when he bought a home. He promised to pay 5% interest a year for the use of this money. How much was the interest for 1 year?

Change 5% to .05.
Find $.05 \times \$3000$. At 5% interest, Mr. Wells would pay \$150 for the use of \$3000 for 1 year.

\$3000, principal .05, rate of interest \$150.00, interest

2. Mr. Adams loaned Mr. Long \$1200 for 6 months at 6%. What is the interest for 6 months?

6% means 6% interest for 1 year.
Find the interest for 1 year. Six months is what fraction of 1 year? Why do you divide \$72 by 2? How would you find the interest for 1 month? for 3 months?

\$1200 .06 2)\$72.00 \$36.00
--

3. Joe has \$75 in the postal savings bank. The bank pays him 2% interest a year. Find his interest for 6 months.

4. Mr. Henry borrowed \$1800 for 15 years at $4\frac{1}{2}\%$ interest. What is the interest for 1 year? How much interest would he pay in 15 years?

$4\frac{1}{2}\% = .045$. Interest for 1 yr. = $.045 \times \$1800$.

Find the interest for 1 year on the following:

- | | | |
|------------------------------|---------------------------|----------------------------|
| 5.) \$75 at 4% | \$500 at 5% | \$1000 at $4\frac{1}{2}\%$ |
| 6.) \$84 at 3% | \$750 at 6% | \$1150 at $3\frac{1}{2}\%$ |
| 7.) \$90 at 5% | \$345 at 4% | \$75.50 at 4% |
| 8.) \$18 at $2\frac{1}{2}\%$ | \$920 at $4\frac{1}{2}\%$ | \$48.50 at 5% |
| 9.) \$15 at 4% | \$105 at 3% | \$75.75 at 2% |

Practice in Fractions

Add. Try to get your first answers right.

$$1. \begin{array}{r} 4\frac{3}{4} \\ 2\frac{5}{6} \end{array} \quad \begin{array}{r} 5\frac{5}{8} \\ 3\frac{1}{6} \end{array} \quad \begin{array}{r} 4\frac{3}{10} \\ 2\frac{3}{4} \end{array} \quad \begin{array}{r} 6\frac{7}{10} \\ 4\frac{2}{5} \end{array} \quad \begin{array}{r} 1\frac{5}{8} \\ 3\frac{5}{12} \end{array} \quad \begin{array}{r} 2\frac{1}{2} \\ 4\frac{1}{2} \end{array} \quad \begin{array}{r} 3\frac{1}{2} \\ 5\frac{1}{2} \end{array}$$

$$2. \begin{array}{r} 5\frac{1}{4} \\ 3\frac{1}{2} \\ 2\frac{3}{8} \end{array} \quad \begin{array}{r} 4\frac{3}{4} \\ 1\frac{1}{2} \\ 3\frac{5}{8} \end{array} \quad \begin{array}{r} 2\frac{5}{12} \\ 4\frac{2}{3} \\ 1\frac{3}{4} \end{array} \quad \begin{array}{r} 5\frac{2}{3} \\ 1\frac{1}{2} \\ 2\frac{5}{6} \end{array} \quad \begin{array}{r} 1\frac{5}{6} \\ 3\frac{3}{4} \\ 1\frac{2}{3} \end{array} \quad \begin{array}{r} 2\frac{1}{2} \\ 5\frac{1}{2} \\ 1\frac{1}{2} \end{array} \quad \begin{array}{r} 7\frac{1}{2} \\ 6\frac{1}{2} \\ 4\frac{1}{2} \end{array}$$

Subtract the following. Take time for correct work.

$$3. \begin{array}{r} 4\frac{1}{8} \\ 1\frac{3}{4} \end{array} \quad \begin{array}{r} 3\frac{3}{8} \\ 2\frac{3}{4} \end{array} \quad \begin{array}{r} 6\frac{1}{2} \\ 4\frac{7}{8} \end{array} \quad \begin{array}{r} 4\frac{1}{6} \\ 2\frac{1}{2} \end{array} \quad \begin{array}{r} 6\frac{1}{4} \\ 1\frac{7}{8} \end{array} \quad \begin{array}{r} 5\frac{7}{10} \\ 4\frac{1}{2} \end{array} \quad \begin{array}{r} 7\frac{1}{2} \\ 4\frac{1}{2} \end{array}$$

$$4. \begin{array}{r} 5\frac{1}{2} \\ 4\frac{9}{10} \end{array} \quad \begin{array}{r} 8\frac{3}{8} \\ 5\frac{1}{2} \end{array} \quad \begin{array}{r} 6\frac{1}{2} \\ 3\frac{1}{3} \end{array} \quad \begin{array}{r} 4\frac{1}{3} \\ 1\frac{1}{4} \end{array} \quad \begin{array}{r} 6\frac{1}{4} \\ 2\frac{2}{3} \end{array} \quad \begin{array}{r} 2\frac{1}{2} \\ 1\frac{1}{2} \end{array} \quad \begin{array}{r} 4\frac{1}{2} \\ 2\frac{1}{2} \end{array}$$

Problems

1. A recipe for drop muffins calls for $1\frac{1}{2}$ cups flour, 3 teaspoons baking powder, $\frac{3}{4}$ teaspoon salt, 3 tablespoons lard, $\frac{1}{3}$ cup milk, and $\frac{1}{3}$ cup water. How much of each item did Mary take if she used half the recipe?

2. Find the cost of 3 lb. coffee at 39¢, $6\frac{1}{2}$ qt. milk at 10¢, $2\frac{1}{2}$ pt. cream at 30¢, 3 qt. berries at $12\frac{1}{2}$ ¢, and 10 lb. sugar at $6\frac{1}{2}$ ¢.

3. On the first of the month Erna had \$18.72 in the bank. During the month she put in \$3.47 and drew out \$2.13. How much did she have in the bank then?

4. At 75¢ an hour, how much will a man earn in $6\frac{1}{4}$ hr.?

5. Mrs. Jones and her daughter took a trip of 480 miles and used $28\frac{1}{2}$ gallons of gasoline. What was the average number of miles they traveled per gallon?

Interest, Discount, and Commission

1. Mr. Burns borrowed \$3600 for 3 months at 5% interest. What is the **amount** (principal and interest) due at the end of 3 months?

How do you find the interest on \$3600 for 1 year? Three months is what fraction of 1 year? How do you find the interest for 3 months? How do you find the amount (principal and interest)?

\$3600, principal
.05, rate
4) \$180.00, int. for 1 yr.
\$45.00, int. for 3 mo.
\$3600.00
\$3645.00, amount

Find the interest and the amount for the following:

- | | |
|--|--|
| 2. \$600 for 2 mo. at 4% | (\$4500 for 1 mo. at 6% |
| 3. \$800 for 3 mo. at $3\frac{1}{2}$ % | (\$2400 for 1 yr. at 5% |
| 4. \$475 for 4 mo. at 4% | (\$6400 for 2 yr. at 2% |
| 5. \$500 for 6 mo. at $2\frac{1}{2}$ % | (\$1200 for 8 mo. at 3% |
| 6. \$320 for 3 mo. at $3\frac{1}{2}$ % | (\$9000 for 2 mo. at $1\frac{1}{2}$ % |

Use the regular price and the rate of discount to find the sale price for each item below:

- | | | | |
|--------------------|-----|-----------------|-------------------|
| 7. Suit..... \$35 | 25% | Table..... \$48 | $33\frac{1}{3}$ % |
| 8. Shoes.... \$9 | 20% | Radio..... \$27 | 40% |
| 9. Piano.... \$450 | 35% | Auto..... \$875 | 15% |
| 10. Rug..... \$175 | 30% | Watch.... \$35 | $16\frac{2}{3}$ % |

Below are given the amount of sales and the rate of commission. Find the commission and the net proceeds.

- | | | | | | | | |
|----------|-----|-------|-----|-------|-------------------|-------|-------------------|
| 11. \$75 | 15% | \$250 | 25% | \$176 | $16\frac{2}{3}$ % | \$120 | $33\frac{1}{3}$ % |
| 12. \$44 | 20% | \$125 | 35% | \$275 | $12\frac{1}{2}$ % | \$900 | 5% |
| 13. \$18 | 25% | \$915 | 30% | \$550 | 15% | \$700 | $12\frac{1}{2}$ % |

Sight Problems

Write the answers.

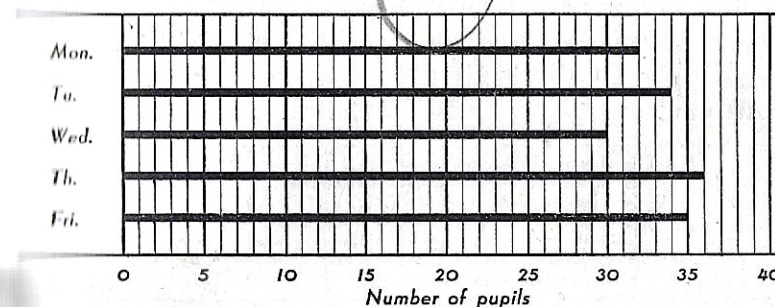
1. Mr. Jones bought goods worth \$200 at a discount of 40%. He paid \$20 freight. What was the total cost of these goods?
2. A book was sold to a dealer at a reduction of 35% of the regular price. What per cent of the regular price did the dealer pay?
3. A \$2 book was sold to a dealer at a discount of 30%. What was the sale price of the book?
4. A table was sold to a dealer at a discount of 25%. What fractional part of the regular price did he pay?
5. At \$24 per thousand feet, what was the cost of 1½ thousand feet of lumber?
6. Find the capacity of a box 3 ft. by 4 ft. by 2½ ft.
7. The regular price of a desk was \$20. At a sale a discount of 25% was allowed. What was the sale price?
8. Mr. Davis got 1½% interest on his bank balance. How much did he receive on \$200 for six months?
9. Mr. Jones sold an \$8,000 house and received \$400 commission. What per cent did he earn on the sale?
10. A rug marked \$48 was sold at a discount of 12½%. What fractional part of the marked price was deducted? For how much did the rug sell?
11. A team lost 15% of the 40 games played. How many games did the team win?
12. At \$6.75 per pair, what was the cost of 3 pairs of shoes?
13. A merchant paid 6¢ apiece for 100 tablets and sold them at 10¢ each. What was his gain?

Unit 27. Graphs

The Bar Graph

You have probably noticed that graphs are often used in newspapers, magazines, and books to show important facts in the story. Among the kinds of graphs you may find are bar graphs, line graphs, circle graphs, and picture graphs.

The bar graph below shows the number of pupils present in a sixth-grade room for each day of a certain week. The class had an enrollment of 36.

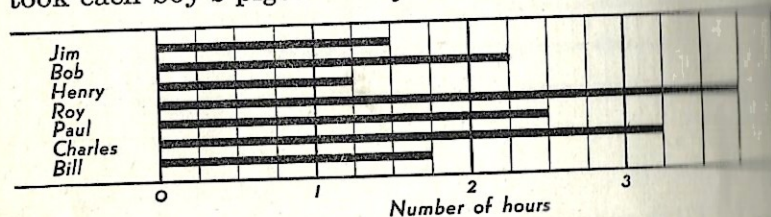


1. How many pupils were present on each day of the week? Was there perfect attendance for any of these days?
2. What fraction of the total number of pupils was present on each day?
3. The attendance in a room of 40 pupils was: Mon. 32, Tu. 34, Wed. 30, Th. 36, Fri. 35. Make a bar graph like the above to show this record.
4. Look in your daily paper and in magazines for other examples of graphs. Bring the graphs to class and be prepared to explain what they mean.



Racing Pigeons

Jim's hobby is keeping pigeons. Last year he entered one of his pigeons in a race with the pigeons of six other boys. The following chart shows the number of hours it took each boy's pigeon to fly the race.



- Whose pigeon won the race? How many hours did it take the winner to fly the race?
- How long did it take Charles's pigeon to fly the race?
- Whose pigeon came in last? How many hours' difference was there between the first and the last pigeon?
- How much longer did Jim's pigeon take than Henry's pigeon?
- If Jim's pigeon had continued at the rate it flew, how long would it have taken to fly a distance twice as long?

Practice in Fractions

Subtract:

- $6\frac{2}{3} - 2\frac{2}{3}$
 $4\frac{1}{5} - 2\frac{1}{2}$
 $8\frac{1}{4} - 5\frac{1}{3}$
 $3\frac{1}{2} - 1\frac{4}{5}$
 $6\frac{2}{5} - 3\frac{2}{3}$
 $5\frac{5}{8} - 3\frac{1}{3}$
 $7\frac{1}{10} - 3\frac{1}{5}$
- $4\frac{2}{3} - 3\frac{1}{2}$
 $5\frac{5}{8} - 1\frac{2}{3}$
 $6\frac{1}{3} - 2\frac{1}{2}$
 $5\frac{3}{8} - 3\frac{2}{3}$
 $7\frac{1}{3} - 4\frac{3}{4}$
 $10\frac{1}{2} - 6\frac{1}{6}$
 $3\frac{5}{6} - 1\frac{3}{4}$
- $4\frac{1}{4} - 2\frac{5}{8}$
 $5\frac{1}{6} - 3\frac{1}{8}$
 $6\frac{3}{8} - 2\frac{5}{6}$
 $7\frac{5}{8} - 3\frac{3}{4}$
 $8\frac{3}{4} - 4\frac{3}{10}$
 $5\frac{5}{6} - 3\frac{5}{8}$
 $8\frac{1}{3} - 5\frac{2}{3}$
- $7\frac{1}{12} - 4\frac{5}{6}$
 $8\frac{7}{12} - 5\frac{1}{4}$
 $5\frac{5}{16} - 2\frac{7}{8}$
 $9\frac{5}{12} - 5\frac{5}{8}$
 $6\frac{1}{2} - 3\frac{4}{9}$
 $8\frac{1}{4} - 4\frac{4}{9}$
 $5\frac{1}{3} - 3\frac{1}{6}$

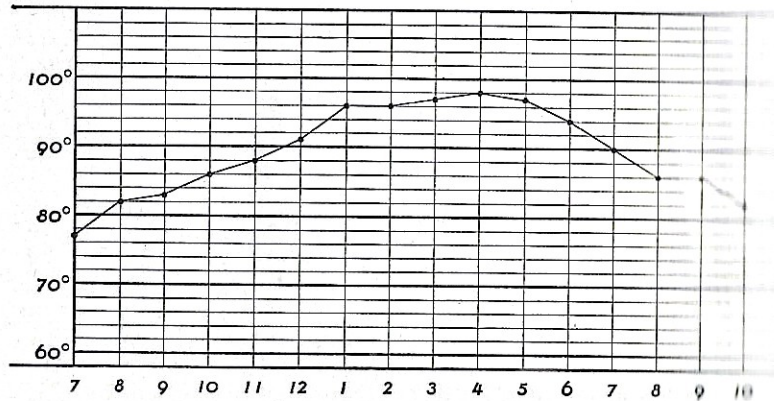
Practice with Bar Graphs

You can use bar graphs to illustrate many kinds of information. Make bar graphs for the following:

- The approximate cost per person of the United States government was: 1860, \$2; 1870, \$8; 1880, \$5; 1890, \$5; 1900, \$7; 1910, \$8; 1920, \$61; 1930, \$32; 1940, \$73.
- The population of the United States, to the nearest million, was: 1800, 5; 1820, 10; 1840, 17; 1860, 32; 1880, 50; 1900, 76; 1920, 106; 1940, 132. Place population figures down the left side and dates across the bottom.
- The land areas of the different continents, to the nearest million square miles, are: Australia, 3; Europe, 4; South America, 7; North America, 9; Africa, 11; Asia, 17.
- The lengths of some of the longest rivers in the world, in hundreds of miles, are: Mississippi, 40; Nile, 40; Amazon, 39; Yangtze, 31; Congo, 29; Mackenzie, 25; La Plata, 23; St. Lawrence, 19; Rio Grande, 18; Ohio, 10.

The Line Graph

The line graph below shows the hourly temperature on a summer day from 7 A.M. to 10 P.M. The hours are shown at the bottom of the graph, and the degrees of temperature are shown at the left. The space between every two horizontal lines represents 2° .



To indicate that the temperature at 7 A.M. was 77° , a dot was placed on the 7 o'clock line halfway between the 76° line and the 78° line. Likewise, a dot was placed to show the temperature for each hour, and a line was drawn to connect these dots. The graph shows clearly how the temperature rose and fell during the day.

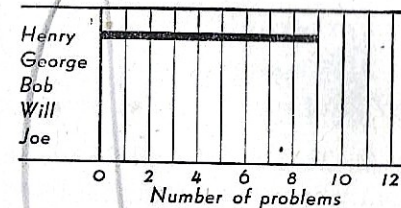
1. Read the temperature on an outdoor thermometer at the end of each hour of one day. Then make a line graph like the one above to show your readings.

2. Make a line graph of the temperature for one day as shown by the weather report in a daily paper.

3. Make a line graph of your grades on arithmetic papers for the past months. Along the side of your paper write the grades 50, 60, 70, 80, 90, 100. Across the top of the graph write the number of your papers, from 1 to 20.

Problems on Graphs

1. In a test of 12 problems, Henry had 9 right, George 11, Bob 7, Will 10, and Joe 8. Copy and finish the graph, showing how many problems each boy had correct.

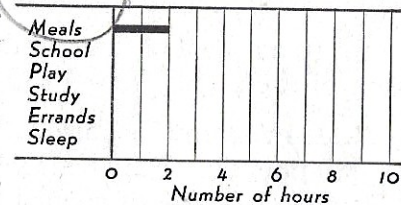


2. In the same test, Jane had 11 right, Clara 12, Nancy 8, Betty 10, and May 9. Make a graph showing these records.

3. In a good-health class, Clara reported that she had spent a certain day as follows:

Meals . 2 hr. School . . 5 hr.
Play . . 5 hr. Study . . 2 hr.
Sleep . 9 hr. Errands . 1 hr.

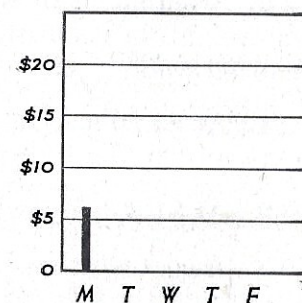
Finish the graph.



4. Make a graph showing how Tom spent his time:
Sleep 8 hr. School . . . 5 hr. Play 6 hr.
Study . . . 1 hr. Meals 2 hr. Errands . . . 2 hr.

5. Make a graph showing how you have spent your time during the past 24 hours.

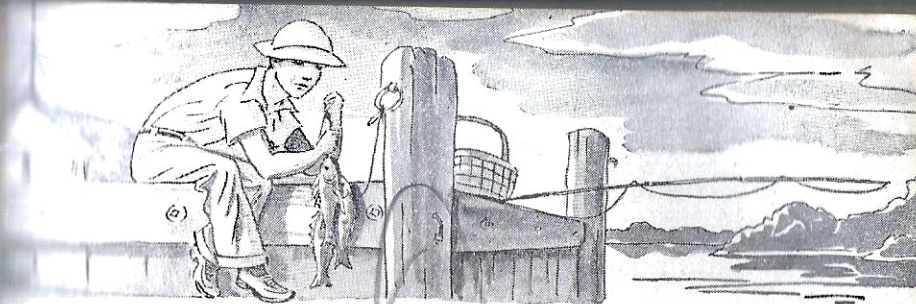
6. Our sixth grade planned to raise \$20 to buy pictures for our room. At the end of each day we added a column to a graph on the board to show how much money we had raised up to that time: Monday, \$6; Tuesday, \$11; Wednesday, \$14; Thursday, \$16; Friday, \$19. Finish the graph.



Problem Practice

For each step write A, S, M, or D. Work the problems.

1. There are 350 pupils enrolled in a school. One day 96% were present. How many pupils were absent?
2. Robert spelled 25 words and got 88% right. How many words were right?
3. What is the volume of a box $10\frac{1}{2}$ in. long, $8\frac{1}{2}$ in. wide, and 6 in. deep?
4. At 8¢ per pint, what is the value of 5 gal. of milk?
5. What is the per cent of reduction on a \$30 suit which is on sale for \$24?
6. In a school of 600 pupils 288 were boys. What per cent of the pupils were girls?
7. How many bushels of shelled corn are there in 13,480 pounds? Find the result to the nearest tenth of a bushel. (1 bushel of shelled corn = 56 pounds.)
8. How many cubic yards of dirt must be excavated to make a ditch 360 ft. long, $3\frac{1}{2}$ ft. wide, and $4\frac{1}{2}$ ft. deep?
9. A room 30 feet long, $27\frac{1}{2}$ feet wide, and 11 feet high seats 33 persons. How many cubic feet of air space per person does the room contain? (Use cancellation.)
10. A shipment of wool weighing 4860 lb. lost 58% of its weight in scouring. What was the weight of the scoured wool?
11. At \$3.20 a square yard, what is the cost of paving a street 660 feet long and 60 feet wide?
12. At \$1.33 $\frac{1}{3}$ a yard, what do 180 yd. of silk cost?
13. A coat which sold at \$37.50 was marked down 30%. What was the sale price?



Unit 28. Denominate Numbers

Addition of Denominate Numbers

1. Harry caught 3 fish, which weighed 1 lb. 4 oz.; 1 lb. 7 oz.; and 1 lb. 8 oz. What did the 3 fish weigh?

Think 4 oz. + 7 oz. + 8 oz. = 19 oz.
Think 19 oz. = 1 lb. 3 oz. Write 3 oz.
and carry 1 lb.

Think 1 lb. + 1 lb. + 1 lb. = 4 lb.
Write 4 lb.

1 lb. 4 oz.
1 lb. 7 oz.
1 lb. 8 oz.
4 lb. 3 oz.

Such numbers as 3 qt., 5 yd., 8 ft., and 12 bu. are called **denominate numbers**. Two or more different denominate numbers taken from the same kind of measure, as 3 ft. 7 in. or 5 lb. 2 oz., are called **compound denominate numbers**.

Add the following:

- | | | |
|--|--|---|
| 2. $\begin{array}{r} 4 \text{ lb. } 6 \text{ oz.} \\ 6 \text{ lb. } 8 \text{ oz.} \\ \hline \end{array}$ | $\begin{array}{r} 16 \text{ lb. } 5 \text{ oz.} \\ 9 \text{ lb. } 15 \text{ oz.} \\ \hline \end{array}$ | $\begin{array}{r} 4 \text{ qt. } 1 \text{ pt.} \\ 5 \text{ qt. } 1 \text{ pt.} \\ \hline \end{array}$ |
| 3. $\begin{array}{r} 5 \text{ bu. } 3 \text{ pk.} \\ 3 \text{ bu. } 2 \text{ pk.} \\ \hline \end{array}$ | $\begin{array}{r} 18 \text{ gal. } 3 \text{ qt.} \\ 9 \text{ gal. } 2 \text{ qt.} \\ \hline \end{array}$ | $\begin{array}{r} 7 \text{ ft. } 8 \text{ in.} \\ 9 \text{ ft. } 6 \text{ in.} \\ \hline \end{array}$ |
| 4. $\begin{array}{r} 32 \text{ min. } 25 \text{ sec.} \\ 10 \text{ min. } 52 \text{ sec.} \\ \hline \end{array}$ | $\begin{array}{r} 4 \text{ hr. } 48 \text{ min.} \\ 6 \text{ hr. } 40 \text{ min.} \\ \hline \end{array}$ | $\begin{array}{r} 6 \text{ yd. } 1 \text{ ft.} \\ 5 \text{ yd. } 1 \text{ ft.} \\ \hline \end{array}$ |
| 5. $\begin{array}{r} 4 \text{ lb. } 12 \text{ oz.} \\ 3 \text{ lb. } 9 \text{ oz.} \\ 6 \text{ lb. } 10 \text{ oz.} \\ \hline \end{array}$ | $\begin{array}{r} 8 \text{ ft. } 3 \text{ in.} \\ 4 \text{ ft. } 11 \text{ in.} \\ 2 \text{ ft. } 9 \text{ in.} \\ \hline \end{array}$ | $\begin{array}{r} 5 \text{ yr. } 6 \text{ mo.} \\ 3 \text{ yr. } 7 \text{ mo.} \\ 2 \text{ yr. } 9 \text{ mo.} \\ \hline \end{array}$ |

Problem Practice

For each step write A, S, M, or D. Work the problems.

1. How much water is there in two cans, one holding 5 gal. 3 qt., and the other holding 2 gal. 2 qt.?
2. A gallon of water weighs 8.355 pounds. What is the weight of a can of water containing 4 quarts, if the can alone weighs 3.5 pounds?
3. A gas meter read 21,200 cu. ft. on November 1 and 26,800 cu. ft. on December 1. What was the cost of the gas used at 90¢ per 1,000 cu. ft.?
4. How much does a plumber earn in $4\frac{1}{2}$ days if he works 8 hours a day at \$1.75 an hour?
5. A school with an enrollment of 950 pupils had an average attendance of 855 during May. What per cent of the enrollment was in attendance?
6. What is the price per bushel for pears when a basket containing $\frac{3}{4}$ of a bushel sells for \$1.50?
7. Mrs. Jones paid a gas bill for 3500 cu. ft. of gas at 90¢ per 1,000 cu. ft. If she was allowed a cash discount of 10%, what amount did she pay?
8. Find the total cost of the following: 3 shirts at \$2, 25% discount; 2 suits at \$25, 33 $\frac{1}{3}$ % discount; 2 hats at \$3.50, 40% discount; 1 overcoat \$60, 20% discount.
9. A bin has a volume of 408 cu. ft. and is 8 $\frac{1}{2}$ ft. deep. What is the area of the floor of the bin?
10. A man earns \$175 a month and spends \$35 of his income for lodging. What per cent does he have left?
11. A dealer bought goods totaling \$1870 at a discount of 45%. He paid \$245 for freight. How much did the goods cost him?

Subtraction of Denominate Numbers

1. One ham weighed 11 lb. 14 oz., and another ham weighed 9 lb. 8 oz. Find the difference in weight.

Write the numbers as shown.

14 oz. - 8 oz. = 6 oz. Write 6 oz.

11 lb. - 9 lb. = 2 lb. Write 2 lb. To prove, add subtrahend and remainder.

11 lb.	14 oz.
9 lb.	8 oz.
2 lb.	6 oz.

2. Fred's fish pole is 8 ft. 9 in. long, and Dan's fish pole is 10 ft. 4 in. long. Fred's fish pole is how much shorter than Dan's?

You cannot subtract 9 in. from 4 in. So take 1 ft., or 12 in., from 10 ft. and add 12 to 4.

10 ft.	4 in.
8 ft.	9 in.
1 ft.	7 in.

Think 4 in. + 12 in. = 16 in. Think 16 in. - 9 in. = 7 in. Since you took 1 ft. from 10 ft., think 9 - 8. Write 1. To prove, add the subtrahend and the remainder.

3. Find the difference in time between 8:45 A.M. and 11:15 A.M.

Subtract. Prove your answers.

- | | | |
|---|--|---|
| 4. $\begin{array}{r} 9 \text{ ft. } 9 \text{ in.} \\ 4 \text{ ft. } 7 \text{ in.} \end{array}$ | $\begin{array}{r} 14 \text{ lb. } 6 \text{ oz.} \\ 6 \text{ lb. } 10 \text{ oz.} \end{array}$ | $\begin{array}{r} 76 \text{ yd. } 2\frac{3}{4} \text{ ft.} \\ 49 \text{ yd. } 1\frac{1}{2} \text{ ft.} \end{array}$ |
| 5. $\begin{array}{r} 12 \text{ gal. } 1 \text{ qt.} \\ 8 \text{ gal. } 3 \text{ qt.} \end{array}$ | $\begin{array}{r} 29 \text{ da. } 4 \text{ hr.} \\ 15 \text{ da. } 18 \text{ hr.} \end{array}$ | $\begin{array}{r} 11 \text{ pk. } 6 \text{ qt.} \\ 8 \text{ pk. } 7 \text{ qt.} \end{array}$ |
| 6. $\begin{array}{r} 16 \text{ hr. } 40 \text{ min.} \\ 4 \text{ hr. } 50 \text{ min.} \end{array}$ | $\begin{array}{r} 12 \text{ bu. } 3 \text{ pk.} \\ 9 \text{ bu. } 1 \text{ pk.} \end{array}$ | $\begin{array}{r} 8 \text{ yd. } 1 \text{ ft.} \\ 3 \text{ yd. } 2 \text{ ft.} \end{array}$ |
| 7. $\begin{array}{r} 45 \text{ min. } 16 \text{ sec.} \\ 6 \text{ min. } 21 \text{ sec.} \end{array}$ | $\begin{array}{r} 7 \text{ yr. } 11 \text{ mo.} \\ 3 \text{ yr. } 2 \text{ mo.} \end{array}$ | $\begin{array}{r} 14 \text{ yr. } 8 \text{ mo.} \\ 5 \text{ yr. } 10 \text{ mo.} \end{array}$ |
| 8. $\begin{array}{r} 8 \text{ qt. } 1 \text{ pt.} \\ 5 \text{ qt. } 1 \text{ pt.} \end{array}$ | $\begin{array}{r} 3 \text{ da. } 14 \text{ hr.} \\ 1 \text{ da. } 18 \text{ hr.} \end{array}$ | $\begin{array}{r} 9 \text{ mo. } 20 \text{ da.} \\ 6 \text{ mo. } 25 \text{ da.} \end{array}$ |

Problem Practice

For each step write A, S, M, or D. Work the problems.

1. Frank's father drove to the lake in 4 hr. 40 min. and returned by another route in 3 hr. 55 min. How much time did he save by taking the second route?

2. A certain man, who earns 85¢ an hour, receives \$30.60 a week. How many hours a week does he work?

3. Dick weighed 97 lb. 8 oz. last year, and now he weighs 102 lb. 4 oz. How much has he gained?

4. Mr. Brown used 12 bu. 2 pk. of wheat to seed one field and 8 bu. 3 pk. to seed another. How much more seed was used for the first field?

5. How much will it cost to furnish 9 ball players with suits at \$5.95, caps at 75¢, and shoes at \$4.80?

6. A family having a yearly income of \$3600 used this budget: rent, 20%; maintenance, 9%; food, 25%; clothing, 16%; advancement, 14%; savings, 16%. What was the amount of each item?

7. Mrs. West bought an electric refrigerator for \$175. She turned in her old refrigerator for 20% of the price and paid 30% in cash. How much did she still have to pay?

8. At \$.35 per square foot, how much will it cost to lay a concrete walk 5 feet wide and 160 feet long?

9. At an average speed of 58.5 miles per hour, how long will it take a train to travel 468 miles?

10. How many bushels are there in a load of oats weighing 3765 pounds? Find the result to the nearest tenth of a bushel. (1 bu. oats = 32 lb.)

11. A tank 1 ft. 6 in. long, 1 ft. wide, and 1 ft. 4 in. deep will hold how many gallons? (1 cu. ft. = $7\frac{1}{2}$ gal.)

Mixed Practice

Add the following:

- | | | |
|---------------------|---------------------|----------------------|
| 1. 4 lb. 13 oz. | 6 ft. 8 in. | 3 hr. 30 min. |
| <u>3 lb. 11 oz.</u> | <u>4 ft. 11 in.</u> | <u>5 hr. 45 min.</u> |

Subtract the following. Prove the answers.

- | | | |
|--------------------|----------------------|---------------------|
| 2. 5 yr. 6 mo. | 11 hr. 20 min. | 5 gal. 1 qt. |
| <u>2 yr. 9 mo.</u> | <u>5 hr. 50 min.</u> | <u>2 gal. 3 qt.</u> |

What per cent is:

- | | | | |
|-------------|-----------|-----------|-----------|
| 3. 6 of 12? | 3 of 12? | 9 of 12? | 4 of 12? |
| 4. 9 of 36? | 16 of 80? | 2 of 6? | 6 of 36? |
| 5. 8 of 72? | 15 of 75? | 15 of 40? | 24 of 36? |
| 6. 4 of 5? | 6 of 8? | 6 of 15? | 8 of 12? |
| 7. 8 of 24? | 4 of 20? | 16 of 18? | 15 of 18? |

Change the per cents below to fractions. Find answers.

- | | | | |
|-----------------------------|-------------------------|------------|-------------------------|
| 8. $12\frac{1}{2}\%$ of 8 | 75% of 16 | 50% of 9 | 25% of 10 |
| 9. $16\frac{2}{3}\%$ of 42 | 40% of 40 | 20% of 25 | 10% of 35 |
| 10. $33\frac{1}{3}\%$ of 6 | $66\frac{2}{3}\%$ of 33 | 80% of 60 | 60% of 45 |
| 11. $37\frac{1}{2}\%$ of 24 | $62\frac{1}{2}\%$ of 72 | 200% of 17 | $6\frac{1}{4}\%$ of 32 |
| 12. 150% of 16 | 125% of 36 | 175% of 8 | $87\frac{1}{2}\%$ of 40 |
| 13. 105% of 40 | 110% of 60 | 250% of 4 | 1% of 800 |

Find the answers. Watch the signs.

- | | | | | |
|---------------------------------|-----------------------------|-----------------------------|------------------------------|-----------------------------|
| 14. $\frac{1}{2} + \frac{5}{8}$ | $\frac{2}{3} - \frac{1}{6}$ | $\frac{3}{8} + \frac{5}{8}$ | $\frac{7}{12} - \frac{1}{2}$ | $\frac{3}{4} + \frac{2}{5}$ |
| 15. $4 - \frac{2}{3}$ | $\frac{7}{8} + \frac{3}{4}$ | $\frac{4}{5} - \frac{1}{2}$ | $\frac{3}{4} + \frac{1}{3}$ | $\frac{5}{6} - \frac{1}{2}$ |
| 16. $\frac{5}{8} + \frac{2}{3}$ | $\frac{3}{8} - \frac{1}{3}$ | $\frac{3}{4} + \frac{5}{8}$ | $\frac{4}{9} - \frac{1}{3}$ | $\frac{2}{3} + \frac{4}{5}$ |
| 17. $\frac{4}{9} - \frac{1}{6}$ | $\frac{1}{2} + \frac{7}{8}$ | $\frac{5}{6} - \frac{3}{4}$ | $\frac{2}{3} + \frac{1}{2}$ | $\frac{1}{6} - \frac{1}{8}$ |

Sight Problems

Write the answers.

1. A \$10 chair was reduced 25%. What was the sale price?
2. How many cubic inches are there in a block of wood $3\frac{1}{2}$ in. by 2 in. by 4 in.?
3. Mrs. Hall bought a radio for \$50. She paid \$10 down and the rest in five monthly installments. What was the amount of each installment?
4. A coal bin is $6\frac{1}{2}$ ft. wide and 10 ft. long. How deep must it be to hold 650 cu. ft.?
5. A camping party of 6 girls spent \$23.40. What was each girl's share of the expenses?
6. Tony spent \$14.60 raising chickens and sold the chickens for \$32. How much did he make?
7. A chair marked \$16.50 was sold at $\frac{1}{3}$ off. What was the amount of the reduction?
8. If your step measures $2\frac{1}{2}$ ft., how many steps do you take in going 250 ft.?
9. Mabel spelled 93% of her words correctly. What per cent did she miss?
10. A family with an income of \$2,000 used 20% of it for rent. How much did they use for rent?
11. Goods listed at \$200 were sold for \$150. What was the per cent of discount?
12. Mary bought 2 tennis balls at \$.35 apiece. What was her change from \$2?
13. If you knew the length and width of a field in rods, how would you find the number of acres in the field?
14. The area of a rectangle is 75 sq. in. Its length is 10 in. What is its width?

Seventh Self-Test

Test in Mixed Work

Write the products.

- | | | | | | | | |
|----|--|--|--|--|---|---|---|
| 1. | $\begin{array}{r} .1 \\ \times .1 \\ \hline \end{array}$ | $\begin{array}{r} .4 \\ \times .6 \\ \hline \end{array}$ | $\begin{array}{r} 2.4 \\ \times 2 \\ \hline \end{array}$ | $\begin{array}{r} .5 \\ \times 6 \\ \hline \end{array}$ | $\begin{array}{r} .5 \\ \times .6 \\ \hline \end{array}$ | $\begin{array}{r} .05 \\ \times .6 \\ \hline \end{array}$ | $\begin{array}{r} 1.3 \\ \times .2 \\ \hline \end{array}$ |
| 2. | $\begin{array}{r} 1.2 \\ \times 1.2 \\ \hline \end{array}$ | $\begin{array}{r} .12 \\ \times 1.2 \\ \hline \end{array}$ | $\begin{array}{r} .12 \\ \times .12 \\ \hline \end{array}$ | $\begin{array}{r} 3.42 \\ \times 10 \\ \hline \end{array}$ | $\begin{array}{r} .342 \\ \times 100 \\ \hline \end{array}$ | $\begin{array}{r} 5.3 \\ \times 5 \\ \hline \end{array}$ | $\begin{array}{r} .04 \\ \times .3 \\ \hline \end{array}$ |

Write the quotients of the following:

- | | | | | | |
|----|---------------------|----------------------|---------------------|----------------------|---------------------|
| 3. | $4\overline{)84}$ | $3\overline{)69}$ | $5\overline{)75}$ | $2\overline{)52}$ | $7\overline{)35}$ |
| 4. | $.5\overline{)4.5}$ | $.6\overline{)48}$ | $3\overline{)09}$ | $9\overline{)1.8}$ | $.4\overline{)8.4}$ |
| 5. | $4\overline{)08}$ | $2\overline{)5.6}$ | $.3\overline{)42}$ | $6\overline{)18}$ | $8\overline{)72}$ |
| 6. | $5\overline{)85}$ | $.9\overline{)8.1}$ | $7\overline{)49}$ | $.3\overline{)2.7}$ | $2\overline{)05}$ |
| 7. | $6\overline{)648}$ | $4\overline{)072}$ | $5\overline{)015}$ | $4\overline{)008}$ | $.3\overline{)804}$ |
| 8. | $3\overline{)12.6}$ | $.7\overline{)30.1}$ | $4\overline{)95.6}$ | $.5\overline{)12.5}$ | $6\overline{)63.6}$ |
| 9. | $.8\overline{)6.4}$ | $.5\overline{)45}$ | $8\overline{)7.2}$ | $.2\overline{)07}$ | $3\overline{)018}$ |

Add the following. Then subtract:

- | | | | | | | | |
|-----|----------------|----------------|----------------|-----------------|-----------------|----------------|-----------------|
| 10. | $2\frac{1}{4}$ | $2\frac{3}{4}$ | $4\frac{3}{4}$ | $8\frac{7}{12}$ | $12\frac{1}{2}$ | $7\frac{5}{8}$ | $6\frac{3}{4}$ |
| | $1\frac{1}{4}$ | $1\frac{1}{2}$ | $2\frac{2}{3}$ | $4\frac{3}{4}$ | $3\frac{3}{16}$ | $4\frac{3}{4}$ | $3\frac{4}{5}$ |
| 11. | $4\frac{3}{4}$ | $5\frac{1}{6}$ | $4\frac{1}{4}$ | $9\frac{5}{6}$ | $8\frac{7}{8}$ | $7\frac{5}{6}$ | $6\frac{7}{10}$ |
| | $2\frac{7}{8}$ | $3\frac{1}{3}$ | $2\frac{2}{3}$ | $7\frac{3}{4}$ | $4\frac{5}{16}$ | $5\frac{7}{8}$ | $2\frac{3}{4}$ |

Change these fractions to per cents:

- | | | | | | | | | |
|-----|---------------|----------------|----------------|----------------|----------------|----------------|----------------|---------------|
| 12. | $\frac{3}{4}$ | $\frac{3}{8}$ | $\frac{1}{10}$ | $\frac{3}{5}$ | $\frac{1}{6}$ | $\frac{5}{6}$ | $\frac{1}{8}$ | $\frac{5}{8}$ |
| 13. | $\frac{1}{4}$ | $\frac{1}{5}$ | $\frac{3}{10}$ | $\frac{1}{2}$ | $\frac{1}{12}$ | $\frac{7}{8}$ | $\frac{1}{3}$ | $\frac{2}{3}$ |
| 14. | $\frac{2}{5}$ | $\frac{7}{10}$ | $\frac{4}{5}$ | $\frac{9}{10}$ | $\frac{1}{20}$ | $\frac{1}{25}$ | $\frac{1}{16}$ | $\frac{1}{7}$ |

Test What You Have Learned

1. What is the per cent of sales paid to an agent for selling called? What is the difference between the amount of sales and the commission called?
2. What is 5% interest on \$3,000 for 1 year?
3. What is 6% interest on \$1200 for 6 months?
4. Name some of the uses for graphs.
5. What are numbers such as 3 qt., 5 yd., 8 ft., and 3 hr. called?
6. What is the difference between 10 ft. 4 in. and 8 ft. 9 in.?
7. What per cent is 24 of 36?
8. What is $16\frac{2}{3}\%$ of 42?
9. Add: $\frac{1}{2} + \frac{5}{8}$ $\frac{3}{8} + \frac{5}{6}$ $\frac{3}{4} + \frac{1}{3}$ $\frac{3}{4} + \frac{2}{5}$ $\frac{3}{4} + \frac{1}{2}$
10. Subtract: $4 - \frac{2}{3}$ $\frac{2}{3} - \frac{1}{6}$ $\frac{7}{12} - \frac{1}{2}$ $\frac{5}{6} - \frac{1}{3}$ $\frac{1}{6} - \frac{1}{12}$
11. Multiply: $1\frac{1}{2} \times 2\frac{1}{2}$ $4\frac{7}{8} \times 4$ $3\frac{3}{4} \times 2\frac{3}{8}$ $2\frac{5}{8} \times 1\frac{1}{4}$
12. Divide: $4 \overline{)6.5}$ $6 \overline{)5}$ $.9 \overline{)10}$ $.09 \overline{).783}$
13. Find the amount due on \$600 at 4% for 2 mo.
14. What is $5\frac{1}{2}\%$ of \$7.48? $16\frac{2}{3}\%$ of \$4.00?
15. Change to per cents: $\frac{1}{4}$, $\frac{2}{3}$, $\frac{3}{5}$, $\frac{1}{25}$, $2\frac{1}{4}$, $1\frac{7}{8}$.
16. Change to fractions: $62\frac{1}{2}\%$, $33\frac{1}{3}\%$, $8\frac{1}{3}\%$, 30% , $37\frac{1}{2}\%$.
17. If you know the amount of a man's salary per year and the per cent he saves during the year, how would you find the amount he has left for other uses?
18. How do you change per cents to decimals?
19. How do you shorten the work of multiplying fractions?

Unit 29. Denominate Numbers

Multiplication



1. In making covers for 5 pillows, Jane finds that she needs 1 yd. 8 in. of material for each pillow. How much material does Jane need in all?

Think $5 \times 8 \text{ in.} = 40 \text{ in.} = 1 \text{ yd. } 4 \text{ in.}$
 Write 4 in. and carry 1 yd.
 Think $5 \times 1 \text{ yd.} + 1 \text{ yd.} = 6 \text{ yd.}$
 Jane needs 6 yd. 4 in. of material.

1 yd. 8 in.
5
6 yd. 4 in.

2. Fred read that the net weight of the corn in a No. 1 can was 1 lb. 4 oz. How can Fred find the net weight of the corn in 6 cans of this size?

Think $6 \times 4 \text{ oz.} = 24 \text{ oz.} = 1 \text{ lb. } 8 \text{ oz.}$
 Write 8 oz. and carry 1 lb.
 Think $6 \times 1 \text{ lb.} + 1 \text{ lb.} = 7 \text{ lb.}$
 The answer is 7 lb. 8 oz.

1 lb. 4 oz.
6
7 lb. 8 oz.

Multiply:

- | | | |
|---|---------------------------------------|---------------------------------------|
| 3. $4 \text{ ft. } 2 \text{ in.}$
5 | $12 \text{ lb. } 6 \text{ oz.}$
12 | $8 \text{ gal. } 3 \text{ qt.}$
7 |
| 4. $8 \text{ yd. } 2 \text{ ft.}$
5 | $4 \text{ hr. } 15 \text{ min.}$
9 | $2 \text{ bu. } 3 \text{ pk.}$
15 |
| 5. $2 \text{ yd. } 9 \text{ in.}$
8 | $3 \text{ pk. } 7 \text{ qt.}$
4 | $12 \text{ ft. } 9 \text{ in.}$
8 |
| 6. $6 \text{ wk. } 6 \text{ da.}$
10 | $2 \text{ yr. } 8 \text{ mo.}$
4 | $5 \text{ hr. } 25 \text{ min.}$
9 |

Problem Practice

For each step write A, S, M, or D. Work the problems.

1. John was building a bookcase for his room. He needed 5 shelves, each 2 ft. 4 in. long. How much shelving did he need?

2. Mary made 6 towels for her mother. Each towel was 1 ft. 6 in. long. How much toweling did she need?

3. Frank cut a piece of wire 6 ft. 4 in. long for his radio from a longer piece 13 ft. 2 in. long. How much of the large piece was left?

4. Stella and Erna rented bicycles for a $3\frac{1}{2}$ -hr. ride. After riding 1 hr. 40 min., how much more time did they have to ride?

5. Robert sold 6 chickens, each weighing 2 lb. 4 oz. What was their total weight?

6. How many pounds of coffee are there in 100 cans, each containing 12 ounces?

7. How many square feet are there in the area of a triangle with a 4-ft. base and a $3\frac{1}{2}$ -ft. altitude?

8. At a sale, men's furnishings sold at a discount of 20% from the marked price. Mr. Jones bought 3 shirts, each marked \$1.75, 6 pairs of socks marked 65¢ a pair, and 3 neckties, each marked \$1.25. How much did all these cost him?

9. If a man's income is \$2200 a year, and he spends \$330 for clothes, what per cent does he spend for clothes?

10. How many cubic feet of dirt are removed in digging a hole for a basement 84 ft. long, 48 ft. wide, and $6\frac{1}{2}$ ft. deep?

11. A group of boy scouts hiked $8\frac{1}{2}$ mi. on Monday, 12 mi. on Tuesday, and $10\frac{1}{2}$ mi. on Wednesday. What was the average number of miles they hiked per day?

Division of Denominate Numbers

1. Tom caught 5 fish which weighed a total of 6 lb. 12 oz. What was the average weight of his fish?

Think $6 \text{ lb.} \div 5 = 1 \text{ lb.}$ and 1 lb. remaining. Write 1 lb. Change the 1 lb. remaining to 16 oz. and add to 12 oz. $28 \text{ oz.} \div 5 = 5\frac{3}{5} \text{ oz.}$ The average weight was 1 lb. $5\frac{3}{5}$ oz.

1 lb.	$5\frac{3}{5}$ oz.
5)6 lb.	12 oz.

Divide the following:

2. $5 \overline{)6 \text{ ft. } 9 \text{ in.}}$ $2 \overline{)3 \text{ mi. } 80 \text{ rd.}}$ $4 \overline{)9 \text{ yd. } 1 \text{ ft.}}$

3. $6 \overline{)15 \text{ lb. } 9 \text{ oz.}}$ $4 \overline{)9 \text{ yr. } 8 \text{ mo.}}$ $5 \overline{)16 \text{ yd. } 2 \text{ ft.}}$

4. $3 \overline{)6 \text{ hr. } 12 \text{ min.}}$ $6 \overline{)15 \text{ ft. } 6 \text{ in.}}$ $4 \overline{)10 \text{ gal. } 2 \text{ qt.}}$

Find the numbers missing in the following lines:

- | | |
|-------------------------------------|---------------------------|
| 5. 2 lb. 8 oz. = ___ oz. | 5 yd. 2 ft. = ___ ft. |
| 6. 6 ft. 9 in. = ___ in. | 4 T. 1200 lb. = ___ lb. |
| 7. 8 bu. 3 pk. = ___ pk. | 6 gal. 3 qt. = ___ qt. |
| 8. 3 hr. 50 min. = ___ min. | 4 yr. 11 mo. = ___ mo. |
| 9. 5 wk. 4 da. = ___ da. | 2 mi. 160 rd. = ___ rd. |
| 10. 50 mo. = ___ yr. ___ mo. | 100 hr. = ___ da. ___ hr. |
| 11. 57 da. = ___ wk. ___ da. | 30 pk. = ___ bu. ___ pk. |
| 12. 35 ft. = ___ rd. ___ ft. | 25 yd. = ___ rd. ___ yd. |
| 13. 25 ft. = ___ yd. ___ ft. | 700 rd. = ___ mi. ___ rd. |
| 14. 17 qt. = ___ gal. ___ qt. | 67 in. = ___ ft. ___ in. |
| 15. 2 min. 25 sec. = ___ sec. | 8 qt. 1 pt. = ___ pt. |
| 16. 3 sq.yd. 6 sq.ft. = ___ sq. ft. | 3 da. = ___ hr. |
| 17. 5500 lb. = ___ T. ___ lb. | 81 in. = ___ yd. ___ in. |



The Girls' Health Club

Five girls in the sixth grade formed a health club so that they might learn more about improving their health.

1. They first compared their weights with those of a year ago. How much did each girl gain?

	Last Year	This Year
Stella	60 lb. 4 oz.	65 lb. 8 oz.
May	62 lb. 4 oz.	68 lb. 4 oz.
Esther	66 lb. 12 oz.	70 lb. 8 oz.
Betty	69 lb. 8 oz.	77 lb. 4 oz.
Jane	70 lb. 12 oz.	75 lb. 4 oz.

2. What was the average weight of the girls last year? What is their average weight this year?

3. The girls also compared their heights with those of a year ago. How much did each girl gain?

	Last Year	This Year
Stella	4 ft. 4 in.	4 ft. 6 in.
May	4 ft. 5 in.	4 ft. 8 in.
Esther	4 ft. 6 in.	4 ft. 8 in.
Betty	4 ft. 7 in.	4 ft. 10 in.
Jane	4 ft. 8 in.	4 ft. 9 in.

4. The girls discussed the amounts of different foods they should eat. They found they needed about 2500 calories, or energy units, every day. Jane learned that 100 calories are obtained by eating either $1\frac{1}{2}$ eggs, 1 cup of orange juice, $1\frac{1}{2}$ slices of wheat bread, $\frac{5}{8}$ cup of milk, $\frac{3}{4}$ cup of oat meal, or $\frac{1}{2}$ cup of apple sauce. What is the total number of calories which she would get by eating 1 egg, 2 slices of bread, 1 cup of milk, 1 cup of oat meal, 1 cup of orange juice, and 1 cup of apple sauce?

Practice with Fractions

Add the following:

- $2\frac{5}{6}$ $3\frac{3}{10}$ $4\frac{5}{8}$ $3\frac{7}{12}$ $2\frac{7}{16}$ $5\frac{4}{5}$ $1\frac{2}{3}$
 $3\frac{1}{2}$ $1\frac{1}{2}$ $2\frac{3}{4}$ $4\frac{3}{4}$ $3\frac{3}{8}$ $6\frac{7}{10}$ $5\frac{5}{12}$
- $3\frac{2}{3}$ $2\frac{1}{5}$ $3\frac{3}{4}$ $5\frac{5}{8}$ $6\frac{2}{3}$ $3\frac{9}{10}$ $2\frac{7}{16}$
 $2\frac{5}{8}$ $3\frac{2}{3}$ $2\frac{2}{5}$ $3\frac{5}{6}$ $3\frac{1}{2}$ $1\frac{3}{4}$ $2\frac{7}{8}$
- $5\frac{3}{10}$ $3\frac{5}{8}$ $7\frac{5}{8}$ $5\frac{3}{5}$ $4\frac{1}{6}$ $3\frac{1}{4}$ $6\frac{9}{16}$
 $4\frac{1}{4}$ $2\frac{2}{3}$ $3\frac{3}{4}$ $4\frac{7}{20}$ $2\frac{2}{9}$ $6\frac{7}{12}$ $3\frac{1}{2}$

Subtract the following:

- 4 $6\frac{3}{4}$ $8\frac{1}{4}$ $5\frac{1}{3}$ $9\frac{3}{8}$ $6\frac{5}{8}$ $7\frac{3}{8}$
 $2\frac{3}{4}$ $3\frac{1}{4}$ $4\frac{3}{4}$ $\frac{2}{3}$ $2\frac{5}{16}$ $3\frac{1}{3}$ $1\frac{3}{4}$
- $7\frac{1}{2}$ $4\frac{1}{4}$ $7\frac{1}{4}$ $8\frac{1}{5}$ $4\frac{7}{9}$ $5\frac{1}{6}$ $6\frac{1}{5}$
 $3\frac{1}{6}$ $1\frac{1}{3}$ $2\frac{5}{8}$ $4\frac{2}{3}$ $2\frac{1}{6}$ $4\frac{1}{2}$ $1\frac{1}{10}$
- $3\frac{1}{4}$ $4\frac{5}{8}$ $5\frac{2}{3}$ $6\frac{2}{3}$ $4\frac{5}{6}$ $7\frac{2}{3}$ $8\frac{1}{5}$
 $1\frac{9}{10}$ $3\frac{1}{2}$ $2\frac{5}{8}$ $4\frac{3}{5}$ $2\frac{1}{2}$ $3\frac{3}{4}$ $5\frac{3}{10}$

Multiply the following:

- $\frac{7}{12} \times \frac{9}{10}$ $\frac{8}{9} \times \frac{15}{16}$ $\frac{5}{8} \times \frac{9}{20}$ $\frac{4}{5} \times 4\frac{1}{6}$ $3\frac{1}{3} \times \frac{2}{3}$
- $4 \times 1\frac{7}{8}$ $3\frac{3}{4} \times \frac{4}{5}$ $5\frac{1}{4} \times \frac{3}{7}$ $\frac{9}{16} \times 24$ $\frac{8}{15} \times 35$
- $4\frac{3}{4} \times 6\frac{2}{3}$ $3\frac{3}{8} \times 6\frac{5}{8}$ $3\frac{1}{5} \times 1\frac{7}{8}$ $1\frac{7}{8} \times 4\frac{2}{3}$ $5\frac{5}{6} \times 3\frac{9}{10}$

Divide the following:

- $\frac{9}{10} \div \frac{3}{4}$ $6 \div \frac{9}{10}$ $1 \div \frac{1}{4}$ $5\frac{1}{3} \div 4$ $6\frac{2}{3} \div 5$
- $\frac{7}{12} \div \frac{5}{6}$ $7 \div 3\frac{1}{2}$ $\frac{7}{8} \div 3$ $9 \div 2\frac{1}{2}$ $\frac{8}{11} \div 2\frac{2}{3}$
- $\frac{5}{6} \div \frac{1}{4}$ $3\frac{2}{3} \div \frac{2}{5}$ $\frac{7}{9} \div 1\frac{1}{3}$ $4\frac{1}{4} \div 5$ $5\frac{1}{3} \div 2\frac{1}{4}$
- $7 \div \frac{2}{3}$ $\frac{7}{12} \div 2\frac{1}{3}$ $8 \div 1\frac{2}{3}$ $4\frac{2}{5} \div 7$ $8\frac{2}{5} \div \frac{7}{5}$

Sight Problems

Write the answers.

- Three shirts, which regularly sold for \$2 apiece, were bought at a sale for \$4. What per cent was saved?
- How many cubic yards of dirt were removed in making an excavation 12 ft. by 18 ft. by 6 ft.?
- How many square yards are there in a strip of carpet $1\frac{1}{2}$ ft. wide and 60 ft. long?
- What is the sale price of a pair of skates marked \$2.50 if a discount of 20% is allowed?
- A man spent 24% of his income for rent, 20% for food, and 16% for clothing. What per cent did he have left for other purposes?
- What did Mrs. Jones pay for her gas bill of \$2.50 on which a cash discount of 4% was allowed?
- If you knew how much a man earned per hour and the amount earned, how would you find the number of hours he worked?
- A man, who was receiving 60¢ an hour, had his wages raised 25%. How much was his increase per hour?
- An agent sold a lot for \$5000. What per cent commission did he get if he received \$250?
- At 40 cu. ft. to the ton, how many cubic feet are there in $2\frac{1}{2}$ tons of coal?
- Mrs. Todd bought 6 dining-room chairs at \$3.20 apiece. How much did she pay for them?
- An old automobile originally priced at \$850 was reduced 40% for a quick sale. For how much did it sell?
- Find the area of a room 9 ft. wide and $12\frac{1}{3}$ ft. long.

Unit 30. Accounts

Carl Keeps an Account

In his spare time, Carl works in his father's store. His father pays him 15¢ an hour. They agree that Carl should keep an account of the amounts earned and received.

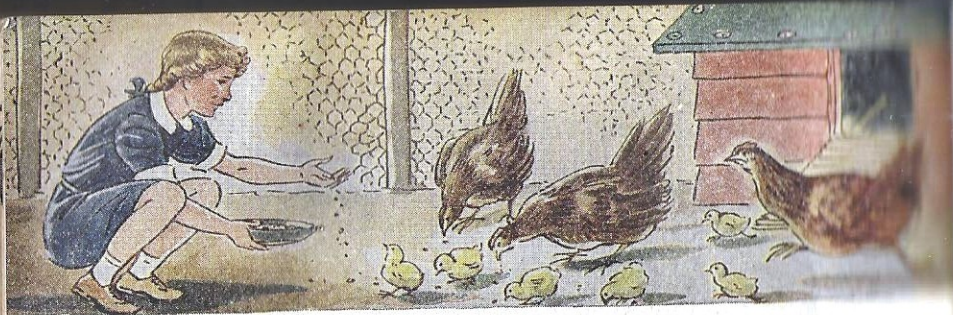


- Below is Carl's account for March. Copy this account and fill in the missing amounts.

Amount Earned				Amount Received			
Mar.	Worked in store			Mar.			
3	3 hr. @ 15¢	\$	45	5	Rec'd cash	\$	1 00
4	2 hr. @ 15¢			7	Rec'd cash		25
5	6 hr. @ 15¢			12	Rec'd cash		1 00
8	2 hr. @ 15¢			19	Rec'd cash		1 00
10	2 hr. @ 15¢			23	Rec'd cash		10
18	3 hr. @ 15¢			26	Rec'd cash		1 00
19	6 hr. @ 15¢						
26	7 hr. @ 15¢				Amount rec'd		
	Amount Earned				Balance due		

- Find the total amount earned and the total cash received.
- What is the balance due after March 26?
- When you know the amount Carl earned and the cash received during the month, how do you find the balance due at the end of the month?
- Why is it desirable for anyone who is employed to keep a record of his earnings and receipts?
- Why do employers keep a record of the rate of pay and the earnings of each employee?

9
 $12\frac{1}{3}$
 379
 3
 18
 380



Mary's Chicken Account

Mary's mother helped her to get a start in raising chickens and selling eggs. She sold Mary some hens, some little chicks, and a coop for \$18.60.

Mary paid her mother a part of this money and agreed to pay the balance with money received in selling eggs.

Mary agreed to keep a complete account of her expenses and her sales so that she could see how much money she made.

Mary's account for April is on the opposite page.

The left side of the account is called the **debit (Dr.)** side. On this side are entered the cost of the chickens and coop and all items of expense. We say she **charges** the account with these items.

The right side of the account is the **credit (Cr.)** side. On this side are entered all items received. We say she **credits** the account with these items. The value of the chickens increases during the month. At the end of the month she also credits the account with the value of the coop and the chickens.

When the sum of the credits is greater than the sum of the debits, the difference is **gain**. When the sum of the debits is greater than the sum of the credits, the difference is **loss**.

Mary's account shows whether she is running her business at a loss or at a gain.

Did Mary Gain or Lose?

Dr. <i>Mary's Chicken Account</i> Cr.			
Apr.		Apr.	
4	Spent for chickens and coop	9	4½ doz. eggs @ 40¢
	\$18 60	16	7½ doz. eggs @ 38¢
8	Paid for feed	16	11 chicks @ 10¢
9	Repairs on coop and fence	23	4 doz. eggs @ 36¢
	2 60	30	5 doz. eggs @ 35¢
16	Paid for feed	30	Value of chickens and coop
20	Paid brother for helping		22 60
	1 50		Total
			Gain

1. Copy Mary's account and put in the missing amounts on the credit side.

2. Find the total of the debits and the total of the credits. Then find her gain for the month of April.

John's Acre of Corn

John belongs to a 4-H Club. For his project, he planted an acre of corn. He kept an accurate account of his expenses and receipts, a summary of which is given below:

Expenses: Rent of ground, \$6.50. Seed corn, \$5. Fertilizer, \$4.50. Planting, 10 hr. work at 20¢. Cultivating, \$3.50. Hoeing, 18 hr. work at 20¢. Husking, 18 hr. work at 20¢. Hauling to station, \$4.

Receipts: Sold 94 bu. at 73¢ per bushel.

1. Rule a sheet of paper and make out John's corn account from the items listed above. Find the total of his expenses and receipts.

2. Find John's gain on the acre of corn.

Add, Subtract, Multiply, or Divide?

For each step write A, S, M, or D. Work the problems.

1. A \$35 coat was sold at a discount of 20%. What was the sale price?
2. Mrs. Murphy bought 3 pieces of linen, each 2 yd. $1\frac{1}{2}$ ft. long. How many yards and feet of linen did she buy?
3. A load of oats weighed 2112 pounds. At \$.57 a bushel, what was its value? (1 bushel oats = 32 lb.)
4. A dealer bought a used car for \$680. After paying \$45 for repairs and \$125 for other expenses, he sold it for \$950. What per cent of the total cost was his gain?
5. A bicycle which was priced at \$24.75 was reduced 20%. What is the price of the bicycle now?
6. What is the cost of 6 electric irons at \$5.85, 30 bulbs at 25¢, 4 batteries at \$4.95, 4 electric-beaters at \$8.30, and 3 lamps at 89¢?
7. Mr. Taylor bought a piano for \$750. He traded in his old piano for \$140 and agreed to pay the balance in 8 monthly installments. What amount was due each month?
8. At the beginning of a football season Charles weighed 125 lb., and at the end of the season he weighed 120 lb. What per cent of his original weight did he lose?
9. A team won 20 games, which was $\frac{2}{5}$ of their total games. How many games did they play?
10. Mrs. Brown used $1\frac{1}{2}$ times the amounts given in the following recipe for English shortcake: $1\frac{1}{2}$ cups flour, $\frac{1}{4}$ teaspoon salt, 2 tablespoons butter, 1 cup sour milk, and $\frac{1}{2}$ teaspoon soda. How much did she use of each item?
11. A plumber earned \$125 in $12\frac{1}{2}$ da. What did he average per day?

Family Budgets

The income of the average family in the United States recently was a little under \$1200 a year.

1. Find the amount used for each item below, using \$1200 as the total annual income. After you have found each amount, prove by adding the amounts to get \$1200.

(a) Food.....	38%	(b) Personal.....	4%
(c) Rent.....	18%	(d) Supplies.....	3%
(e) Operating.....	12%	(f) Recreation.....	2%
(g) Clothing.....	9%	(h) Education.....	2%
(i) Transportation.....	7%	(j) Miscellaneous.....	1%
(k) Health.....	4%	(l) Total.....	100%

2. A man having a family of four and earning \$1850 a year spent 20% of his salary for rent, 30% for food, 10% for clothing, 33% for other expenses, and saved the rest. What amount did he save?

3. A family with an income of \$4000 a year spent 20% for food, 20% for rent, 15% for clothing, 10% for insurance, and 15% for operating expenses. Find the average per month for each item. How much was left each month for other expenses?

4. Sarah was given an allowance of \$2 a month, of which she spent 30% for carfare, 25% for school supplies, and 20% for pleasure. How much did she spend on each item, and what did she have left?

5. Mr. Jones earns \$240 per month, and his average monthly expenses are \$190. In how many months can he save \$1000?

6. A single man earning \$1800 a year spent an average of \$35 a month for food, \$30 for rent, and \$32 for clothing. In the course of a year what per cent of his income did he spend for each of these items?

Practice with Discounts

Find the sale price and the saving on each of the following articles. Think of the per cents as fractions.

	Regular price	Dis- count		Regular price	Dis- count
1. Radio	\$120	25%	Piano	\$600	33 $\frac{1}{3}$ %
2. Typewriter	\$105	20%	Desk	\$36	16 $\frac{2}{3}$ %
3. Davenport	\$120	5%	Lamp	\$18	10%
4. Table	\$96	37 $\frac{1}{2}$ %	Chair	\$64	12 $\frac{1}{2}$ %
5. Rug	\$125	30%	Book	\$3	25%
6. Overcoat	\$48	25%	Suit	\$45	20%
7. Dress	\$20	30%	Shirt	\$2	25%
8. Hat	\$8.40	33 $\frac{1}{3}$ %	Tie	\$1.50	33 $\frac{1}{3}$ %
9. Automobile	\$840	16 $\frac{2}{3}$ %	Tire	\$18	50%
10. Football	\$5	25%	Shoes	\$6.50	20%

Multiplication of Decimals

Multiply:

1.	$\begin{array}{r} 639.6 \\ 8.6 \\ \hline \end{array}$	$\begin{array}{r} 40.46 \\ 67 \\ \hline \end{array}$	$\begin{array}{r} 4.901 \\ 5.2 \\ \hline \end{array}$	$\begin{array}{r} 546.8 \\ .75 \\ \hline \end{array}$	$\begin{array}{r} 9837 \\ .95 \\ \hline \end{array}$
2.	$\begin{array}{r} 7857 \\ 9.7 \\ \hline \end{array}$	$\begin{array}{r} 5.903 \\ .98 \\ \hline \end{array}$	$\begin{array}{r} 988.6 \\ .53 \\ \hline \end{array}$	$\begin{array}{r} .4973 \\ 6.4 \\ \hline \end{array}$	$\begin{array}{r} 89.06 \\ .37 \\ \hline \end{array}$
3.	$\begin{array}{r} 6.879 \\ 4.3 \\ \hline \end{array}$	$\begin{array}{r} .4504 \\ 9.8 \\ \hline \end{array}$	$\begin{array}{r} 83.72 \\ 2.75 \\ \hline \end{array}$	$\begin{array}{r} 5.938 \\ 86.4 \\ \hline \end{array}$	$\begin{array}{r} 65.39 \\ 5.87 \\ \hline \end{array}$
4.	$\begin{array}{r} 24.9 \\ 7.3 \\ \hline \end{array}$	$\begin{array}{r} 87.97 \\ 3.6 \\ \hline \end{array}$	$\begin{array}{r} 680.6 \\ .95 \\ \hline \end{array}$	$\begin{array}{r} .8467 \\ 84 \\ \hline \end{array}$	$\begin{array}{r} 2680 \\ .847 \\ \hline \end{array}$
5.	$\begin{array}{r} 742.3 \\ 5.4 \\ \hline \end{array}$	$\begin{array}{r} 90.86 \\ 4.07 \\ \hline \end{array}$	$\begin{array}{r} 8900 \\ 1.17 \\ \hline \end{array}$	$\begin{array}{r} .0456 \\ .001 \\ \hline \end{array}$	$\begin{array}{r} 6943 \\ .163 \\ \hline \end{array}$

Unit 31. Review Practice

Finding What Per Cent One Number Is of Another

1. A major league baseball team won 97 and lost 55 of its games during one season. What was the standing of the team?

The team played $97 + 55 = 152$ games. To find the standing of the team, divide the number of games won by the number played. $97 \div 152 = .6381$, or .638, the standing, correct to the nearest thousandth.

2. Find the standing of the baseball teams given in the newspaper. Divide the number of games each team has won by the number each team has played and compare your results with those in the newspaper.

3. A suit which sold regularly at \$38 was reduced to \$28.50. What per cent was the price reduced?

$\$38 - \$28.50 = \$9.50$. $\$9.50 \div \$38 = .25 = 25\%$. Proof: 25% of $\$38 = .25 \times \$38 = \$9.50$.

4. In a spelling test of 50 words, Fred spelled 41 words correctly, Ruth 49, May 44, Tom 39, and Roy 40. What per cent of the words did each pupil spell correctly?

In each of the following, what per cent is the first number of the second?

5.	11, 50	18, 24	15, 65	36, 120
6.	24, 60	17, 68	27, 72	19, 125
7.	12, 21	15, 48	13, 25	36, 145
8.	3, 17	6, 45	21, 72	34, 160
9.	16, 57	34, 45	28, 63	25, 135

Problems Using Large Numbers

For each step write A, S, M, or D. Work the problems.

1. The steamship "Queen Elizabeth" has a capacity of 85,000 tons and the "Mauretania" a capacity of 35,739 tons. The tonnage of the "Mauretania" is what per cent of that of the "Queen Elizabeth"?

2. The "City of Denver," a fast Diesel train, went from Grand Island to Columbus, a distance of 62.4 mi., in 46 min. What was its speed in miles per hour, to the nearest tenth? (First find the speed per minute.)

3. A Santa Fe train ran from Chicago to Los Angeles, a distance of 2228.6 mi., in 34 hr. 45 min. What was its speed in miles per hour, to the nearest hundredth?

4. In 1940 the public debt of the United States was approximately \$43,000,000,000, and the population was 132,000,000. What was the debt per person?

5. The population of the United States in 1930 was about 123,000,000 and in 1940 about 132,000,000. What was the per cent of increase from 1930 to 1940?

6. The popular vote for president in 1940 totaled about 50 million, of which President Roosevelt secured 27 million votes. What per cent of the total vote did he receive?

7. Use facts given in problems 5 and 6 to find what per cent of the population voted at the 1940 election.

8. New York State increased in population from about 12,600,000 in 1930 to 13,500,000 in 1940. What was the per cent of increase?

9. In 1939 there were about 32,500 fires in New York City. The fire loss amounted to about \$8,600,000. What was the average loss per fire?

Practice with Decimals

Write in figures:

- 7 and 15 hundredths 10 and 24 thousandths
- 245 ten-thousandths 45 and 7 hundredths

Find the answers. Watch the signs.

- $1.04 + .046 + 6.9 + .0678 + 467.3 + 20.92$
- $4 - .76$ $6.4 - .79$ $.86 - .085$ $6.08 - 2.7$
- $67.8 + 7.95 + .706 + 8.074 + 356.3 + .08$
- $8.2 - 3.75$ $1.054 - .97$ $100 - 78.2$ $5.7 - 1.06$

Multiply the following:

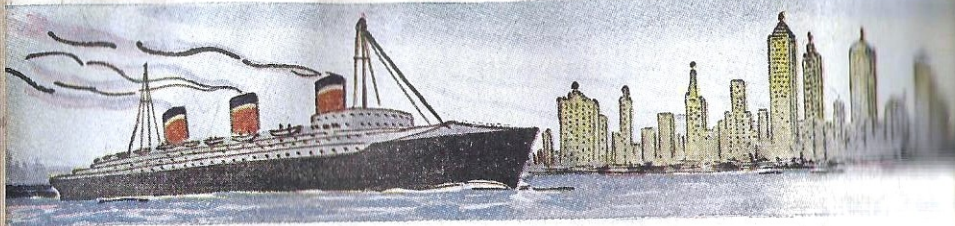
- | | | | | | |
|--|---|--|---|---|---|
| 7. $\begin{array}{r} 5.9 \\ 43 \end{array}$ | $\begin{array}{r} .08 \\ .03 \end{array}$ | $\begin{array}{r} .005 \\ .03 \end{array}$ | $\begin{array}{r} 3.56 \\ .74 \end{array}$ | $\begin{array}{r} 5.04 \\ 4.09 \end{array}$ | $\begin{array}{r} 49.8 \\ 75 \end{array}$ |
| 8. $\begin{array}{r} .87 \\ .06 \end{array}$ | $\begin{array}{r} .46 \\ 2.7 \end{array}$ | $\begin{array}{r} .065 \\ .74 \end{array}$ | $\begin{array}{r} 60.7 \\ .018 \end{array}$ | $\begin{array}{r} 450 \\ 7.9 \end{array}$ | $\begin{array}{r} 86.1 \\ 5.7 \end{array}$ |
| 9. $\begin{array}{r} 7.5 \\ 3.8 \end{array}$ | $\begin{array}{r} .68 \\ .36 \end{array}$ | $\begin{array}{r} .875 \\ .29 \end{array}$ | $\begin{array}{r} 16.8 \\ .47 \end{array}$ | $\begin{array}{r} 5.64 \\ 7.9 \end{array}$ | $\begin{array}{r} 38.9 \\ .006 \end{array}$ |

Divide the following:

- $4 \overline{)4.8}$ $.6 \overline{)1.26}$ $.03 \overline{).45}$ $.42 \overline{)840}$ $2.5 \overline{)62.5}$
- $.3 \overline{).27}$ $8 \overline{)78.4}$ $4.5 \overline{).9}$ $2.3 \overline{).069}$ $.25 \overline{)6.25}$
- $.5 \overline{)405}$ $.07 \overline{).028}$ $.06 \overline{)7.2}$ $31 \overline{)6.2}$ $25 \overline{).625}$
- $7 \overline{).28}$ $.4 \overline{)320}$ $.09 \overline{)810}$ $.024 \overline{)9.6}$ $2.5 \overline{)625}$

Change the following to decimals, correct to the nearest thousandth.

- $\frac{3}{8}$ $\frac{7}{16}$ $\frac{2}{3}$ $\frac{5}{6}$ $\frac{11}{12}$ $\frac{1}{9}$ $\frac{3}{4}$ $\frac{4}{5}$
- $\frac{19}{40}$ $\frac{7}{15}$ $\frac{1}{3}$ $\frac{21}{45}$ $\frac{19}{37}$ $\frac{27}{41}$ $\frac{32}{53}$ $\frac{41}{75}$
- $\frac{9}{16}$ $\frac{3}{17}$ $\frac{13}{21}$ $\frac{16}{26}$ $\frac{18}{63}$ $\frac{12}{24}$ $\frac{5}{81}$ $\frac{7}{98}$



Steamships and Skyscrapers

On his return from a trip to New York City, Mr. James told John and Mabel about the large ocean steamships he had seen in New York Harbor. In the almanac he found the interesting information about ships given at the right.

	Length	Breadth	Depth
Normandie	981'4"	117'9"	57'6"
Queen Mary	975'2"	118'6"	68'5"
Mauretania	739'4"	89'4"	51'7"
George Washington	690'1"	78'2"	50'1"
President Coolidge	615'0"	81'3"	28'2"

1. How much longer is the "Normandie" than each of the other steamships?

2. How much greater breadth has the "Queen Mary" than each of the others?

3. How much greater depth has the "Queen Mary" than each of the others?

Mr. James also found some information about the high buildings in New York.

	Height	Stories
Empire State	1250'	102
Chrysler	1046'	77
Bank of Manhattan	927'	90
Woolworth	792'	60
Metropolitan Life	700'	50

4. What is the average height of each story in the Empire State, to the nearest hundredth? in the other buildings?

Practice with Fractions

Add the following:

- $4\frac{1}{2}$ $6\frac{2}{3}$ $3\frac{1}{4}$ $7\frac{2}{3}$ $5\frac{4}{9}$ $2\frac{3}{4}$ $8\frac{5}{6}$
 $2\frac{3}{4}$ $1\frac{5}{8}$ $4\frac{5}{12}$ $5\frac{3}{4}$ $2\frac{5}{6}$ $3\frac{7}{12}$ $6\frac{7}{8}$
- $3\frac{1}{2}$ $7\frac{3}{5}$ $8\frac{3}{4}$ $4\frac{5}{6}$ $2\frac{3}{4}$ $6\frac{7}{8}$ $9\frac{1}{2}$
 $2\frac{1}{2}$ $4\frac{7}{10}$ $3\frac{7}{16}$ $4\frac{7}{12}$ $1\frac{4}{5}$ $3\frac{5}{12}$ $4\frac{1}{6}$

Subtract the following:

- $5\frac{1}{2}$ $4\frac{1}{8}$ $7\frac{1}{3}$ $8\frac{1}{2}$ $9\frac{9}{16}$ $6\frac{1}{12}$ $3\frac{2}{3}$
 $2\frac{1}{2}$ $1\frac{3}{8}$ $5\frac{3}{4}$ $3\frac{5}{6}$ $6\frac{3}{8}$ $2\frac{1}{4}$ $1\frac{5}{8}$
- $6\frac{2}{3}$ $8\frac{4}{5}$ $5\frac{9}{10}$ $7\frac{7}{12}$ $3\frac{1}{3}$ $7\frac{7}{9}$ $4\frac{9}{10}$
 $5\frac{1}{4}$ $6\frac{1}{3}$ $3\frac{2}{5}$ $5\frac{2}{3}$ $2\frac{1}{4}$ $4\frac{2}{3}$ $2\frac{3}{4}$

Multiply the following:

- $4\frac{1}{2} \times 17$ $3\frac{1}{4} \times 18$ $2\frac{3}{4} \times 20$ $3\frac{1}{2} \times 7$
- $2\frac{1}{2} \times 31$ $2\frac{3}{8} \times 40$ $3\frac{3}{4} \times 25$ $2\frac{3}{4} \times 42$
- $3 \times 8\frac{1}{3}$ $4 \times 6\frac{1}{4}$ $5 \times 12\frac{1}{2}$ $4 \times 16\frac{2}{3}$

Sight Problems

1. Mr. James bought 7 kegs of nails at \$6.25 per keg. How much did these nails cost him?

2. A book priced at \$2 is advertised to sell at a 20% discount. What is the sale price?

3. A man earns \$200 a month and saves $\frac{1}{4}$ of it. At this rate, how much does he save in a year?

4. How many square yards are there in a flower bed $5\frac{1}{2}$ ft. by 9 ft.?

5. How many rods of wire are needed to put a 5-wire fence around a garden 4 rd. by 6 rd.?

Sight Problems

1. Bob wants 3 pieces of board, each $2\frac{1}{3}$ ft. long. How long a board does he need?
2. James sold 6 chickens which weighed $19\frac{1}{2}$ lb. What was the average weight?
3. At $6\frac{1}{2}$ ¢ per pound, what do 50 lb. of sugar cost?
4. If you take away $\frac{1}{2}$ of a number, what per cent of the number is left?
5. A man bought an automobile and paid 30% cash. What per cent did he still have to pay?
6. A lamp that sold for \$5 has been reduced $\frac{1}{5}$. What is the sale price?

Practice with Fractions

Add:

1. $5\frac{5}{6}$ $8\frac{3}{4}$ $3\frac{1}{2}$ $7\frac{7}{8}$ $9\frac{4}{5}$ $4\frac{9}{10}$ $2\frac{1}{3}$
 $2\frac{1}{12}$ $3\frac{7}{16}$ $5\frac{5}{8}$ $3\frac{9}{16}$ $2\frac{2}{3}$ $3\frac{1}{2}$ $1\frac{4}{5}$
 $4\frac{1}{4}$ $5\frac{5}{8}$ $2\frac{3}{4}$ $5\frac{1}{2}$ $4\frac{1}{6}$ $2\frac{3}{5}$ $1\frac{1}{3}$

Subtract the following:

2. $2\frac{5}{6}$ $6\frac{1}{12}$ $4\frac{7}{10}$ $8\frac{1}{3}$ $9\frac{3}{4}$ $5\frac{7}{10}$ $3\frac{2}{5}$
 $1\frac{3}{8}$ $3\frac{1}{4}$ $2\frac{3}{4}$ $5\frac{2}{15}$ $4\frac{5}{12}$ $3\frac{1}{2}$ $2\frac{8}{15}$
3. $4\frac{1}{4}$ $7\frac{5}{6}$ $5\frac{1}{2}$ $8\frac{4}{5}$ $6\frac{1}{4}$ $9\frac{1}{6}$ $3\frac{3}{10}$
 $1\frac{1}{2}$ $2\frac{7}{8}$ $4\frac{1}{5}$ $5\frac{7}{10}$ $4\frac{9}{16}$ $6\frac{2}{3}$ $2\frac{4}{5}$

Divide the following:

4. $4 \div \frac{8}{15}$ $\frac{5}{6} \div 4$ $10 \div \frac{2}{5}$ $\frac{2}{3} \div 1\frac{1}{8}$ $3\frac{1}{8} \div \frac{1}{3}$
5. $15 \div \frac{5}{6}$ $1\frac{5}{6} \div 32$ $3 \div \frac{9}{16}$ $\frac{5}{8} \div \frac{5}{16}$ $\frac{3}{4} \div \frac{3}{10}$
6. $\frac{4}{5} \div \frac{1}{8}$ $\frac{5}{12} \div \frac{1}{4}$ $\frac{3}{10} \div \frac{1}{5}$ $6 \div \frac{3}{4}$ $\frac{7}{8} \div 4$

Unit 32. Review and Test Practice

Fractions, Decimals, and Per Cents

Change each per cent to a decimal and then to a fraction. Ex.: 40% = .4 = $\frac{2}{5}$.

1. 1% 2% $2\frac{1}{2}$ % $3\frac{1}{3}$ % 4% 5%
2. $6\frac{1}{4}$ % $8\frac{1}{3}$ % $9\frac{1}{11}$ % 10% $11\frac{1}{5}$ % $12\frac{1}{2}$ %
3. $16\frac{2}{3}$ % $18\frac{3}{4}$ % 20% 25% 30% $33\frac{1}{3}$ %
4. $37\frac{1}{2}$ % 40% 45% 50% 60% $62\frac{1}{2}$ %
5. 70% 75% 80% $83\frac{1}{3}$ % $87\frac{1}{2}$ % 90%

Change the per cents below to decimals and then to whole or mixed numbers. Ex.: $137\frac{1}{2}$ % = $1.37\frac{1}{2}$ = $1\frac{3}{4}$.

6. 150% 125% 175% 120% 140%
7. $112\frac{1}{2}$ % $137\frac{1}{2}$ % $162\frac{1}{2}$ % $187\frac{1}{2}$ % 280%
8. $133\frac{1}{3}$ % $166\frac{2}{3}$ % $116\frac{2}{3}$ % 275% 1000%

Change each fraction below to a decimal and then to a per cent. Ex.: $\frac{2}{3}$ = .66 $\frac{2}{3}$ = 66 $\frac{2}{3}$ %.

9. $\frac{1}{2}$ $\frac{1}{3}$ $\frac{2}{3}$ $\frac{1}{4}$ $\frac{3}{4}$ $\frac{1}{5}$ $\frac{2}{5}$ $\frac{3}{5}$
10. $\frac{4}{5}$ $\frac{1}{6}$ $\frac{5}{6}$ $\frac{1}{7}$ $\frac{1}{8}$ $\frac{3}{8}$ $\frac{5}{8}$ $\frac{7}{8}$
11. $\frac{1}{9}$ $\frac{1}{10}$ $\frac{1}{12}$ $\frac{1}{16}$ $\frac{1}{20}$ $\frac{1}{25}$ $\frac{1}{40}$ $\frac{1}{50}$
12. $\frac{7}{10}$ $\frac{9}{20}$ $\frac{13}{25}$ $\frac{5}{16}$ $\frac{7}{12}$ $\frac{2}{7}$ $\frac{4}{9}$ $\frac{7}{40}$

Change the per cents below to decimals. Ex.: $3\frac{1}{4}$ % = .0325. Take time for accurate work.

13. 7% $4\frac{1}{2}$ % 4.5% $8\frac{3}{4}$ % 12.7% $9\frac{1}{4}$ %
14. 49% 10.8% 2.1% .2% .5% $\frac{1}{2}$ %
15. $1\frac{1}{8}$ % 1.1% 117% $46\frac{1}{2}$ % 31.3% $104\frac{1}{4}$ %

Problem Practice

For each step write A, S, M, or D. Work the problems.

1. Hats priced at \$5 are being sold at a discount of $33\frac{1}{3}\%$. How much less than the original price would Mrs. Owen and her two daughters pay if each bought one hat?

2. Mary has $12\frac{3}{4}$ yd. of cloth. If she uses $1\frac{1}{2}$ yd. for an apron and $3\frac{3}{4}$ yd. for a dress, how much will she have left?

3. If George walks $\frac{2}{3}$ of a mile in 10 minutes, how long will it take him to walk a mile?

4. If a man takes a step $2\frac{1}{2}$ ft. long every $\frac{1}{2}$ second, how many minutes will it take him to walk a mile?

5. A mountain is 3960 ft. in height. What fraction of a mile is this height?

6. Mr. Jones drove 15.2 miles on a gallon of gasoline. How far did he travel on 15 gallons?

7. How far did Fred run in going 3.5 times around a track which was 220 yards long?

8. The air flight from New York to Pittsburgh is 338 miles. How many miles per hour does the airplane go which makes the flight in $2\frac{1}{2}$ hours?

9. An airplane flying over a mountain range 8,240 ft. high, flew at an altitude of 10,000 ft. What fraction of a mile above the range did the plane fly?

10. If Jane used $1\frac{3}{8}$ yd. for an apron, how many aprons can she make out of $5\frac{1}{2}$ yd. of material?

11. At the rate of a mile in $1\frac{1}{2}$ min., how many hours and minutes will it take an automobile to travel 144 miles?

12. If it costs 55¢ for a 3-minute telephone call and 10¢ for each additional minute, what does a 9-minute telephone call cost?

Finding Per Cents of Numbers

Change the per cents to fractions and find the answers.

- | | | |
|-------------------------------|---------------------------|-----------------------------|
| 1. 25% of \$36 | 50% of \$21 | 10% of \$12 |
| 2. 20% of \$46 | 75% of \$30 | 40% of \$120 |
| 3. $6\frac{1}{4}\%$ of \$9.60 | $16\frac{2}{3}\%$ of \$45 | $12\frac{1}{2}\%$ of \$50 |
| 4. $33\frac{1}{3}\%$ of \$25 | $66\frac{2}{3}\%$ of \$75 | $37\frac{1}{2}\%$ of \$7.20 |
| 5. 60% of \$9 | $8\frac{1}{3}\%$ of \$48 | 30% of \$280 |

In each example below find the percentage to the nearest cent:

- | | | |
|-------------------|------------------|----------------|
| 6. 7% of \$1.25 | 4.9% of \$25 | 27% of \$8.50 |
| 7. 35% of \$8.75 | 115% of \$2.70 | 8.1% of \$5.36 |
| 8. 26% of \$1.70 | 18.3% of \$6.50 | 24.7% of \$18 |
| 9. 9.2% of \$4.17 | 31.5% of \$10.80 | .9% of \$105 |
| 10. 72% of \$17 | 4.6% of \$3.35 | 1.5% of \$5.24 |

Find, to the nearest cent, the discount and the sale price for each of the regular prices below:

- | | | | |
|-----------------------------|-------------------------|---------------------------|--------------------------|
| 11. \$18, 25% | \$10, $33\frac{1}{3}\%$ | \$4.40, $12\frac{1}{2}\%$ | \$750, 15% |
| 12. \$75, $16\frac{2}{3}\%$ | \$35, 25% | \$7.75, 20% | \$825, $33\frac{1}{3}\%$ |
| 13. \$45, 30% | \$28, $12\frac{1}{2}\%$ | \$8.98, $33\frac{1}{3}\%$ | \$485, 25% |
| 14. \$28, $33\frac{1}{3}\%$ | \$33, 15% | \$6.80, 25% | \$350, $12\frac{1}{2}\%$ |

For each of the sales below find the commission and net proceeds:

- | | | | |
|----------------|------------|--------------------------|--------------------------|
| 15. \$265, 35% | \$750, 40% | \$215, 10% | \$970, $12\frac{1}{2}\%$ |
| 16. \$377, 20% | \$325, 25% | \$450, $16\frac{2}{3}\%$ | \$860, 18% |
| 17. \$585, 15% | \$643, 45% | \$175, $33\frac{1}{3}\%$ | \$8750, 3% |
| 18. \$475, 30% | \$6850, 5% | \$7500, 4% | \$9600, $2\frac{1}{2}\%$ |

Sight Problems

1. Dave bought 3 golf balls at 60¢ apiece. What was his change from \$2?
2. At \$16 per thousand, what do 5,000 bricks cost?
3. How many acres are there in a field 80 by 160 rd.?
4. Mrs. Todd bought a coat for her daughter for \$29.80, a pair of shoes for \$6, and a hat for \$4. How much did these items cost?
5. At a sale Mrs. Davis bought 4 small rugs for \$17. What was the cost per rug?
6. A merchant paid 5¢ apiece for 200 writing tablets and sold them at 8¢ each. How much did he make?
7. Mrs. Smith bought a piano for \$660. She paid \$200 down and the balance in 4 equal installments. What was the amount of each installment?
8. What is the cost of a \$4 hat that is advertised to sell at 75% of the marked price?
9. If you knew the number of miles an automobile traveled and the number of hours driven, how would you find the average speed per hour?
10. Mr. Jones bought a lock for \$1.50 and a pair of hinges for \$.95. What was his change from \$5?
11. John wanted a radio that was priced at \$28, but he had only \$22. Later he saw that the price had been reduced 25%. If he bought the radio at the reduced price, would he have money left or would he need more money? How much?
12. Jack earned some money during the summer and spent 60% of it. What per cent did he have left?

Mixed Practice

Change the cents to a fraction of a dollar. Then find results to the nearest cent.

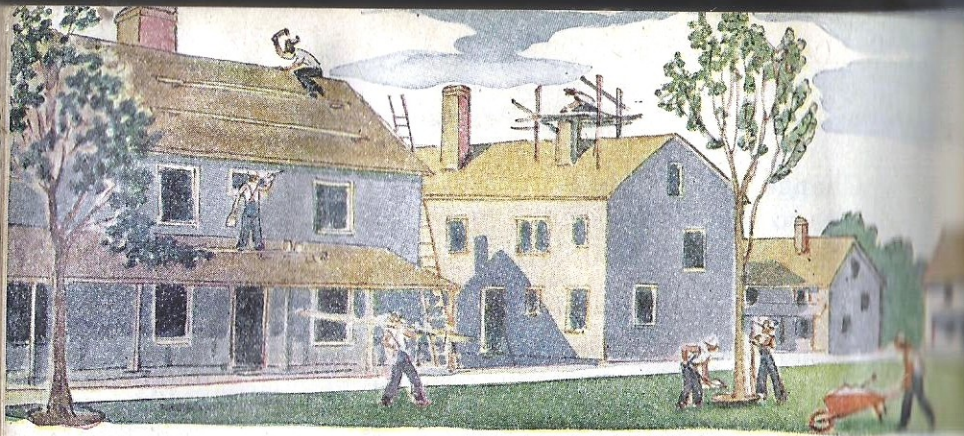
- | | | | |
|--------------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| 1. $640 \times 25\text{¢}$ | $280 \times 75\text{¢}$ | $150 \times 50\text{¢}$ | $350 \times 20\text{¢}$ |
| 2. $42 \times 16\frac{2}{3}\text{¢}$ | $500 \times 40\text{¢}$ | $72 \times 33\frac{1}{3}\text{¢}$ | $56 \times 12\frac{1}{2}\text{¢}$ |
| 3. $850 \times 25\text{¢}$ | $54 \times 66\frac{2}{3}\text{¢}$ | $80 \times 37\frac{1}{2}\text{¢}$ | $64 \times 62\frac{1}{2}\text{¢}$ |
| 4. $760 \times 10\text{¢}$ | $96 \times 87\frac{1}{2}\text{¢}$ | $700 \times 30\text{¢}$ | $450 \times 40\text{¢}$ |

On your paper write the missing per cents in the examples below:

- | | | |
|---------------------------------|-----------------------|-----------------|
| 5. 10 is ___% of 40 | 16 is ___% of 24 | 6 is ___% of 10 |
| 6. 12 is ___% of 36 | 7 is ___% of 35 | 3 is ___% of 5 |
| 7. 24 is ___% of 32 | 12 is ___% of 96 | 6 is ___% of 9 |
| 8. $7\frac{1}{2}$ is ___% of 15 | 15 is ___% of 40 | 1 is ___% of 4 |
| 9. 56 is ___% of 64 | 50 is ___% of 80 | 5 is ___% of 8 |
| 10. 7 is ___% of 42 | 6 is ___% of 15 | 4 is ___% of 6 |
| 11. 35 is ___% of 56 | 4 is ___% of 48 | 2 is ___% of 8 |
| 12. 12 is ___% of 84 | 8 is ___% of 50 | 1 is ___% of 5 |
| 13. What % of 150 is 25? | 15 is what % of 120? | |
| 14. What % of 144 is 12? | 28 is what % of 35? | |
| 15. What % of 132 is 33? | 140 is what % of 160? | |

Find the interest on:

- | | |
|---------------------------|-------------------------------------|
| 16. \$250 for 1 yr. at 5% | \$300 for 6 mo. at 4% |
| 17. \$480 for 2 yr. at 6% | \$725 for 3 mo. at 3% |
| 18. \$900 for 2 mo. at 2% | \$840 for 4 mo. at $3\frac{1}{2}\%$ |
| 19. \$600 for 1 mo. at 5% | \$560 for 8 mo. at $4\frac{1}{2}\%$ |
| 20. \$785 for 1 yr. at 4% | \$180 for 9 mo. at 3% |
| 21. \$800 for 1 yr. at 3% | \$420 for 6 mo. at $2\frac{1}{2}\%$ |



Housing Problems

During recent years the United States government has been helping many thousands of its citizens build homes for themselves at reasonable costs. The following problems will help you understand the reasons for this help:

1. In 1936 there were about 29,900,000 families in the United States and only 40.47% had incomes of more than \$2000 a year. How many families had incomes of less than \$2000 a year?

2. Of these 29,900,000 families, 6,670,000 lived on farms. What per cent did not live on farms?

3. A study was made of 1,500,000 city dwellings, and it was found that 16.7% were more than 40 years old. How many dwellings were in this group?

4. Of these 1,500,000 city dwellings, 20.6% rented for less than \$15 per month. How many did this include?

5. Many families with incomes of \$600 a year paid a monthly rent of \$17.50 in these city dwellings. What per cent of their income did they pay for rent?

6. The United States Housing Authority paid \$68,542,000 to 140,600 workers for building new homes. What was the average amount paid to these workers?

Eighth Self-Test

Test in the Four Fundamentals

Add. Check your answers.

1.	98	1836	697	4680	789	1981
	79	19	9682	357	6960	5677
	67	6257	315	1288	858	286
	46	789	8572	76	8707	51
	75	6059	273	569	410	902
	39	97	1887	5809	793	6878
	83	764	98	376	7894	1167

Subtract the numbers below. Prove your answers.

2.	4017	6097	2952	4000	5234	8181
	209	4828	2693	3697	5186	1809
3.	7253	1026	8020	6635	4010	7231
	6178	397	4976	2089	2918	5729

Multiply the following:

4.	8.6	3.9	.67	.84	480	6.14	1.8
	56	2.7	8.3	.92	.07	.88	.04

Divide the following:

5.	53)47.7	.38)319.2	75)6.3	3.8)307.8
6.	1.6)1.44	1.4)916	5.2)3.7	.87)4.002
7.	.68)51.6	1.9)6.21	8.6)534	4.5)7.02

8. Find each per cent in row B of each number in A.

A	14	2.7	150	86	\$65	\$7.50
B	10%	18%	4.5%	150%	25%	90%

Problem Test

For each step write A, S, M, or D. Work the problems.

1. A coat priced at \$37.50 was marked down 30%. What was the sale price?
2. On a field 20 rods by 60 rods, a farmer raised 1200 bushels of potatoes. How many bushels per acre was this?
3. What was the discount on a \$45 dress which was placed on sale at 20% off the regular price?
4. How much less would 12 cans of 25¢ peaches cost on sale at 17½¢ a can than when sold at the regular price?
5. Jim earns \$.34 a day selling papers. How long will it take him to earn enough money to buy a bicycle that costs \$25.50?
6. What is the cost of 8 milk cans at \$6.15, 1 milk cooler at \$7.50, 40 strainers at 98¢, 60 pint bottles at \$1.05 per dozen, and 60 quart bottles at \$1.35 per dozen?
7. Tom bought 3 baseballs at \$1.25 apiece. What change did he receive from \$10?
8. Double this recipe for graham muffins: $\frac{3}{4}$ c. graham flour, $\frac{1}{3}$ c. white flour, $\frac{1}{4}$ teaspoon salt, 1 tablespoon sugar, 2 teaspoons baking powder, 2 tablespoons butter, $\frac{3}{4}$ c. milk, 1 egg.
9. A company paid \$35 to bind 250 textbooks. What was the cost per book?
10. There are 24 quart boxes in a crate of berries that costs \$4.80. At this rate, what is the cost of 4 boxes?
11. Joe saved \$51.25. How much did he have after paying \$19.50 for a radio and \$4.75 for a tennis racket?
12. If a train goes 40.5 miles in one hour, how many hours will it take to go 121.5 miles?

Sight Test

Add. Write the answers only.

1. $\frac{1}{3} + \frac{1}{4} = \frac{7}{12}$ $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $\frac{1}{2} + \frac{3}{4} = \frac{5}{4}$ $\frac{1}{2} + \frac{2}{3} = \frac{7}{6}$ $\frac{2}{3} + \frac{3}{4} = \frac{17}{12}$ $\frac{3}{8} + \frac{1}{4} = \frac{5}{8}$ $\frac{5}{8} + \frac{1}{2} = \frac{7}{8}$ $\frac{1}{8} + \frac{3}{4} = \frac{7}{8}$
2. $\frac{1}{2} + \frac{1}{6} = \frac{2}{3}$ $\frac{1}{3} + \frac{1}{6} = \frac{1}{2}$ $\frac{2}{3} + \frac{1}{6} = \frac{5}{6}$ $\frac{2}{3} + \frac{5}{6} = \frac{9}{6} = \frac{3}{2}$ $\frac{1}{2} + \frac{5}{6} = \frac{8}{6} = \frac{4}{3}$ $\frac{1}{4} + \frac{1}{12} = \frac{1}{3}$ $\frac{1}{3} + \frac{1}{12} = \frac{5}{12}$ $\frac{3}{4} + \frac{5}{12} = \frac{11}{6}$
3. $\frac{2}{3} + \frac{1}{12} = \frac{9}{12} = \frac{3}{4}$ $\frac{1}{3} + \frac{1}{6} = \frac{1}{2}$ $\frac{3}{8} + \frac{1}{6} = \frac{11}{24}$ $\frac{1}{8} + \frac{1}{6} = \frac{5}{24}$ $\frac{1}{4} + \frac{1}{6} = \frac{5}{12}$ $\frac{1}{3} + \frac{3}{8} = \frac{11}{24}$ $\frac{1}{2} + \frac{7}{10} = \frac{17}{10}$ $\frac{3}{5} + \frac{1}{4} = \frac{17}{20}$

Subtract the fractions below:

4. $\frac{1}{2} - \frac{1}{4} = \frac{1}{4}$ $\frac{1}{3} - \frac{1}{4} = \frac{1}{12}$ $\frac{1}{2} - \frac{1}{3} = \frac{1}{6}$ $\frac{2}{3} - \frac{1}{2} = \frac{1}{6}$ $\frac{3}{4} - \frac{2}{3} = \frac{1}{12}$ $\frac{3}{8} - \frac{1}{4} = \frac{1}{8}$ $\frac{5}{8} - \frac{1}{2} = \frac{1}{8}$ $\frac{3}{4} - \frac{1}{8} = \frac{5}{8}$
5. $\frac{1}{2} - \frac{1}{6} = \frac{1}{3}$ $\frac{1}{3} - \frac{1}{6} = \frac{1}{6}$ $\frac{5}{6} - \frac{1}{2} = \frac{1}{3}$ $\frac{1}{4} - \frac{1}{12} = \frac{1}{6}$ $\frac{1}{3} - \frac{1}{12} = \frac{1}{4}$ $\frac{3}{8} - \frac{1}{3} = \frac{1}{24}$ $\frac{1}{6} - \frac{1}{8} = \frac{1}{24}$ $\frac{1}{2} - \frac{2}{5} = \frac{1}{10}$

Find the answers for the following. Watch the signs.

6. $\frac{1}{2} \times \frac{2}{3} = \frac{1}{3}$ $8 \times \frac{3}{4} = 6$ $\frac{2}{3} \times 6 = 4$ $\frac{3}{4} \times \frac{1}{2} = \frac{3}{8}$ $1\frac{1}{2} \times 3 = 4\frac{1}{2}$
7. $1\frac{1}{2} \times 1\frac{1}{2} = 2\frac{1}{4}$ $2\frac{1}{2} \times 2\frac{1}{2} = 6\frac{1}{4}$ $1\frac{1}{3} \times 1\frac{1}{2} = 2$ $2\frac{2}{3} \times 1\frac{1}{3} = 4$ $4\frac{1}{2} \times 1\frac{1}{3} = 7$
8. $\frac{2}{3} \div \frac{1}{6} = 4$ $\frac{1}{3} \div \frac{1}{4} = \frac{4}{3}$ $1\frac{1}{2} \div \frac{2}{3} = 2\frac{1}{4}$ $\frac{3}{4} \div \frac{2}{3} = \frac{9}{8}$ $1\frac{1}{2} \div 4 = \frac{1}{8}$
9. $\frac{4}{5} \div \frac{2}{15} = 6$ $\frac{3}{7} \div \frac{1}{2} = \frac{6}{7}$ $1\frac{1}{4} \div 1\frac{1}{2} = \frac{2}{3}$ $6\frac{1}{2} \div 2 = 3\frac{1}{4}$ $5\frac{1}{3} \div \frac{2}{3} = 8$
10. 25% of 52 = 13 40% of 50 = 20 125% of \$45 = \$56.25
11. 16⅔% of 18 = 3 62½% of 48 = 30 120% of \$30 = \$36
12. 12½% of 120 = 15 33⅓% of 63 = 21 66⅔% of \$81 = \$54
13. 8 is —% of 16 24 is —% of 80
14. 10 is —% of 5 15 is —% of 20
15. 12 is —% of 18 60 is —% of 200

Testing What You Have Learned

1. How do you change a per cent to a fraction?
2. How do you change a fraction to a decimal?
3. Name six items included in a family budget.
4. What per cent is \$24 of \$30?
5. What is the sale price of a \$25 coat at 10% discount?
6. Change to decimals: 3%, 17%, 125%, $66\frac{2}{3}\%$.
7. Divide: $\frac{3}{4} \div \frac{4}{5}$, $4\frac{1}{2} \div 2\frac{1}{4}$, $16 \div 2\frac{3}{4}$, $6 \div 2\frac{1}{2}$.
8. How much is 15% commission on a sale of \$8.20?
9. Find the interest on \$200 for six months at $4\frac{1}{2}\%$.
10. What is the interest on \$4500 for two years at $3\frac{1}{2}\%$?
11. Mary's height last year was 4' 11". Now it is 5' 1". How much has she grown?
12. Add: 12 gal. 1 qt. and 8 gal. 3 qt.; 16 bu. 1 pk. and 9 bu. 3 pk.; 13 yr. 9 mo. and 4 yr. 11 mo.
13. Multiply: 2 ft. 8 in. by 5; 8 pk. 4 qt. by 8; 4 yd. 1 ft. by 4.
14. Change to fractions: $61\frac{1}{4}\%$, 45%, $87\frac{1}{2}\%$, $33\frac{1}{3}\%$, 75%.
15. What per cent is 10 of 40? 12 of 36? 50 of 80?
16. Find the interest on \$250 for 1 yr. at 5%.
17. Multiply: 8.8×23 , $.67 \times .92$, $6.18 \times .04$.
18. Divide: $49.3 \div 52$, $327.4 \div .27$, $.92 \div 7.3$.
19. Change to per cents: $\frac{3}{4}$, $\frac{2}{3}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{6}$, $\frac{3}{5}$, $\frac{2}{9}$.
20. Change to decimals: $7\frac{1}{4}\%$, 95%, $\frac{1}{2}\%$, $\frac{2}{3}$, $\frac{1}{5}$, $\frac{1}{6}$.

Testing Your Readiness for Next Year's Work

Review in Addition and Subtraction

If you can do the work in the following pages, you may be sure that you are ready for next year.

Add downward. Check by adding upward.

1.	49	86	968	7579	5471	\$75.08
	75	58	379	5967	8398	6.70
	28	72	754	9693	3779	34.25
	63	56	646	6824	8543	27.62
2.	73	25	594	3672	5469	\$58.75
	24	62	635	3394	8927	6.07
	68	85	979	9986	6768	3.95
	39	58	489	5658	9841	75.65

Copy in columns, add, and check:

3. \$78.46, \$31.04, \$28.69, \$87.59, \$568.48, \$603.49.
4. \$649, \$570.98, \$20.50, \$2.57, \$2567.10, \$284.78.

Subtract and prove:

5.	876	167	962	4861	8114	4206
	52	74	28	95	537	4127
6.	705	603	807	6021	7003	9101
	392	598	398	2608	3889	3209
7.	528	751	817	7893	4530	8151
	475	637	609	2827	1558	7168
8.	875	948	585	7243	4254	9064
	789	269	458	3238	3659	7,8738

Sight Problems

1. Joe bought a knife for 75¢ and a belt for 35¢. What was his change from \$1.50?
2. When mixed nuts sell at $\frac{1}{2}$ lb. for 37¢, what will 2 lb. of nuts cost at the same rate?
3. Tom worked from 8:30 A.M. until 12 noon. At 30¢ an hour, how much did he earn?
4. A motorboat ran 35 miles in 4 hours. What was its average speed?
5. Mary bought 6 cans of corn at $12\frac{1}{2}$ ¢ per can. What was her change from a dollar?
6. Harry is building a poultry pen 10 yd. long. How wide must he make it to contain 300 sq. ft.?
7. At 10¢ per foot, how much will Fred pay for wire screen to fence his garden, which is 15 ft. by 20 ft.?
8. When tomato soup sells at 3 cans for 20¢, how much will 2 dozen cans of soup cost?
9. At 12¢ per quart, how much does a dairyman get for a 10-gallon can of milk?
10. When potatoes sell at \$1.50 per 100 pounds, what is the value of 1 ton of potatoes?
11. Joan pays 9¢ for a magazine that she sells for 15¢. How many must she sell to make a gain of \$1.50?
12. When bananas sell at 3 lb. for 19¢, what will 9 lb. of bananas cost?
13. At 30¢ per square foot, what will it cost to lay a cement walk 40 ft. long and 3 ft. wide?
14. At the rate of 2 boxes for 25¢, how many boxes of cherries can you get for \$2?

Review in Multiplication

Multiply. Check by multiplying again.

- | | | | | | | | |
|---|--|--|--|---|--|--|--|
| 1. $\begin{array}{r} 43 \\ \times 2 \\ \hline \end{array}$ | $\begin{array}{r} 62 \\ \times 3 \\ \hline \end{array}$ | $\begin{array}{r} 24 \\ \times 4 \\ \hline \end{array}$ | $\begin{array}{r} 68 \\ \times 50 \\ \hline \end{array}$ | $\begin{array}{r} 90 \\ \times 60 \\ \hline \end{array}$ | $\begin{array}{r} 57 \\ \times 28 \\ \hline \end{array}$ | $\begin{array}{r} 75 \\ \times 46 \\ \hline \end{array}$ | $\begin{array}{r} 84 \\ \times 79 \\ \hline \end{array}$ |
| 2. $\begin{array}{r} 638 \\ \times 4 \\ \hline \end{array}$ | $\begin{array}{r} 629 \\ \times 8 \\ \hline \end{array}$ | $\begin{array}{r} 571 \\ \times 5 \\ \hline \end{array}$ | $\begin{array}{r} 609 \\ \times 7 \\ \hline \end{array}$ | $\begin{array}{r} 860 \\ \times 60 \\ \hline \end{array}$ | $\begin{array}{r} 670 \\ \times 900 \\ \hline \end{array}$ | $\begin{array}{r} 394 \\ \times 59 \\ \hline \end{array}$ | |
| 3. $\begin{array}{r} 308 \\ \times 87 \\ \hline \end{array}$ | $\begin{array}{r} 738 \\ \times 243 \\ \hline \end{array}$ | $\begin{array}{r} 342 \\ \times 608 \\ \hline \end{array}$ | $\begin{array}{r} 920 \\ \times 430 \\ \hline \end{array}$ | $\begin{array}{r} 570 \\ \times 703 \\ \hline \end{array}$ | $\begin{array}{r} 804 \\ \times 900 \\ \hline \end{array}$ | $\begin{array}{r} 899 \\ \times 744 \\ \hline \end{array}$ | |
| 4. $\begin{array}{r} 5269 \\ \times 5 \\ \hline \end{array}$ | $\begin{array}{r} 7160 \\ \times 7 \\ \hline \end{array}$ | $\begin{array}{r} 8107 \\ \times 8 \\ \hline \end{array}$ | $\begin{array}{r} 2059 \\ \times 9 \\ \hline \end{array}$ | $\begin{array}{r} 8007 \\ \times 6 \\ \hline \end{array}$ | $\begin{array}{r} 5760 \\ \times 40 \\ \hline \end{array}$ | | |
| 5. $\begin{array}{r} 4197 \\ \times 75 \\ \hline \end{array}$ | $\begin{array}{r} 5176 \\ \times 29 \\ \hline \end{array}$ | $\begin{array}{r} 7063 \\ \times 58 \\ \hline \end{array}$ | $\begin{array}{r} 9141 \\ \times 36 \\ \hline \end{array}$ | $\begin{array}{r} 6080 \\ \times 64 \\ \hline \end{array}$ | $\begin{array}{r} 7800 \\ \times 89 \\ \hline \end{array}$ | | |
| 6. $\begin{array}{r} 7642 \\ \times 381 \\ \hline \end{array}$ | $\begin{array}{r} 9406 \\ \times 702 \\ \hline \end{array}$ | $\begin{array}{r} 8047 \\ \times 903 \\ \hline \end{array}$ | $\begin{array}{r} 5340 \\ \times 604 \\ \hline \end{array}$ | $\begin{array}{r} 7017 \\ \times 930 \\ \hline \end{array}$ | $\begin{array}{r} 9500 \\ \times 750 \\ \hline \end{array}$ | | |
| 7. $\begin{array}{r} \$8.94 \\ \times 5 \\ \hline \end{array}$ | $\begin{array}{r} \$7.26 \\ \times 8 \\ \hline \end{array}$ | $\begin{array}{r} \$5.07 \\ \times 9 \\ \hline \end{array}$ | $\begin{array}{r} \$6.98 \\ \times 7 \\ \hline \end{array}$ | $\begin{array}{r} \$4.39 \\ \times 6 \\ \hline \end{array}$ | $\begin{array}{r} \$9.74 \\ \times 4 \\ \hline \end{array}$ | | |
| 8. $\begin{array}{r} \$59.76 \\ \times 46 \\ \hline \end{array}$ | $\begin{array}{r} \$80.78 \\ \times 57 \\ \hline \end{array}$ | $\begin{array}{r} \$45.06 \\ \times 94 \\ \hline \end{array}$ | $\begin{array}{r} \$65.30 \\ \times 53 \\ \hline \end{array}$ | $\begin{array}{r} \$97.80 \\ \times 60 \\ \hline \end{array}$ | | | |
| 9. $\begin{array}{r} \$12.68 \\ \times 345 \\ \hline \end{array}$ | $\begin{array}{r} \$92.45 \\ \times 700 \\ \hline \end{array}$ | $\begin{array}{r} \$83.25 \\ \times 409 \\ \hline \end{array}$ | $\begin{array}{r} \$47.68 \\ \times 360 \\ \hline \end{array}$ | $\begin{array}{r} \$74.15 \\ \times 56 \\ \hline \end{array}$ | $\begin{array}{r} \$74.15 \\ \times 901 \\ \hline \end{array}$ | | |
| 10. 56×897 | 704×832 | 92×480 | 609×705 | | | | |
| 11. 48×750 | 350×620 | 80×700 | 407×830 | | | | |
| 12. $9 \times \$7.60$ | $67 \times \$35.98$ | $410 \times \$675.80$ | | | | | |
| 13. $8 \times \$6.46$ | $94 \times \$60.49$ | $600 \times \$482.75$ | | | | | |
| 14. $17 \times 49 \times 453$ | $24 \times 80 \times 640$ | $10 \times 100 \times 100$ | | | | | |

Problem Practice

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1. Frank bought a suit for \$23.75, shoes for \$5.95, and 3 shirts at \$1.39 each. Find the cost of all.
2. At a price of \$9.75 per desk, what is the cost of 6 rows of desks with 7 desks in a row?
3. Nancy has saved \$8.50. If she saves \$3 a week, how long will it take her to have enough money to buy a bicycle that costs \$32.50?
4. Fred's father drove his car 297 miles between 1 P.M. and 8 P.M. What was the average speed per hour?
9. 5. Mr. Allen bought a battery for \$7.39, a tire for \$12.98, and gasoline for \$1.42. What was his change from \$25?
10. 6. When it costs \$19.80 for linoleum to cover a floor 9 ft. by 12 ft., what is the cost per square yard?
7. Mr. Boyd sold 3 turkeys weighing 13 lb., 14 lb., and 17 lb. at 36¢ per pound. How much was he paid?
8. Mr. Black's car averages 16 miles per gallon of gas. At 19¢ per gallon, what is the cost of gas for a trip of 752 miles?
9. A farmer sold 3 loads of wheat weighing 4185 lb., 3863 lb., and 4747 lb. At 60 lb. per bushel, how many bushels of wheat did he sell?
10. Mrs. Wilson has \$3.75 in her purse. How much more does she need to pay for a 14 lb. ham at 37¢ a pound?
11. From a 40-acre field, 1080 bu. of wheat were harvested. At 85¢ per bushel, what was the value of this wheat per acre?
12. At \$140 per acre, what is the value of a farm 160 rods long and 80 rods wide?

Review in Division

Divide and prove:

- | | | | | |
|----------------------------|------------------------|------------------------|------------------------|-----------------------|
| 1. $4\overline{)176}$ | $6\overline{)984}$ | $3\overline{)223}$ | $8\overline{)725}$ | $9\overline{)306}$ |
| 2. $7\overline{)800}$ | $5\overline{)450}$ | $6\overline{)486}$ | $9\overline{)187}$ | $8\overline{)401}$ |
| 3. $5\overline{)1965}$ | $3\overline{)4011}$ | $9\overline{)9072}$ | $4\overline{)5001}$ | $6\overline{)8020}$ |
| 4. $7\overline{)8738}$ | $4\overline{)8630}$ | $2\overline{)6235}$ | $3\overline{)1444}$ | $8\overline{)7500}$ |
| 5. $6\overline{)7811}$ | $5\overline{)8999}$ | $7\overline{)6000}$ | $8\overline{)7008}$ | $9\overline{)8030}$ |
| 6. $4\overline{)17613}$ | $6\overline{)27423}$ | $8\overline{)64498}$ | $5\overline{)27545}$ | |
| 7. $9\overline{)63075}$ | $7\overline{)20049}$ | $3\overline{)70550}$ | $4\overline{)75757}$ | |
| 8. $3922 \div 4$ | $4503 \div 6$ | $4073 \div 8$ | $2831 \div 4$ | |
| 9. $6455 \div 8$ | $8183 \div 9$ | $5042 \div 7$ | $3722 \div 6$ | |
| 10. $4956 \div 7$ | $2462 \div 8$ | $7446 \div 9$ | $6369 \div 8$ | |
| 11. $21\overline{)632}$ | $32\overline{)837}$ | $72\overline{)575}$ | $91\overline{)931}$ | $52\overline{)507}$ |
| 12. $69\overline{)483}$ | $38\overline{)199}$ | $46\overline{)329}$ | $73\overline{)211}$ | $89\overline{)749}$ |
| 13. $51\overline{)4234}$ | $26\overline{)1351}$ | $82\overline{)4765}$ | $91\overline{)6375}$ | $28\overline{)2531}$ |
| 14. $72\overline{)4468}$ | $34\overline{)1268}$ | $98\overline{)2004}$ | $29\overline{)8231}$ | $63\overline{)2431}$ |
| 15. $36\overline{)1875}$ | $64\overline{)1608}$ | $37\overline{)1833}$ | $46\overline{)2817}$ | $54\overline{)4933}$ |
| 16. $37\overline{)2119}$ | $46\overline{)2625}$ | $28\overline{)9165}$ | $26\overline{)1695}$ | $25\overline{)2600}$ |
| 17. $92\overline{)50341}$ | $35\overline{)70331}$ | $43\overline{)17501}$ | 1.8 | $88\overline{)46640}$ |
| 18. $73\overline{)59663}$ | 7.8 | $37\overline{)21080}$ | $60\overline{)48635}$ | $36\overline{)34093}$ |
| 19. $356\overline{)50784}$ | $419\overline{)91743}$ | $568\overline{)11407}$ | $793\overline{)80649}$ | |

Problem Practice

1. At the rate of 40¢ a dozen, what do 9 oranges cost?
2. Working 5 days each week, 8 hours per day at \$1.19 an hour, how much will a carpenter earn in 48 weeks?
3. Fred worked $4\frac{1}{2}$ hr. for 30¢ an hour and spent 90¢ for a baseball mitt. What part of his wages did he spend?
4. At \$40 per 1000 ft., what would you pay for 450 ft. of lumber?
5. At 40¢ a pound, what is the cost of a piece of bacon weighing 3 pounds and 12 ounces?
6. A store bought pencils at \$4.45 per gross and sold them at 5¢ each. What was the gain per gross?
7. If he uses one peck of timothy seed per acre, how much will a farmer pay for seed for 15 acres at \$6 per bushel?
8. At \$9 per ton, what do 2500 lb. of coal cost?
9. Barley weighs 48 lb. per bushel. At 76¢ per bushel, what is the value of a 3600-lb. load of barley?
10. If you buy 3 lb. 8 oz. of steak at 48¢ per pound, what is your change from \$2?
11. At the rate of 4 bars for 19¢, what do 3 dozen bars of soap cost?
12. At 3 cans for 55¢, what would you have to pay for 1 can of pears?
13. When a railroad ticket costs \$9.65 for a trip of 386 miles, what is the fare per mile?
14. What will Mr. Bell have to pay for having the street in front of his home paved, if he must pay for a strip 18 ft. by 50 ft. at \$4.20 per square yard?

Working with Fractions

Change these fractions to the lowest terms:

1. $\frac{2}{10}$ $\frac{4}{5}$ $\frac{8}{16}$ $\frac{10}{25}$ $\frac{5}{8}$ $\frac{8}{20}$ $\frac{5}{9}$ $\frac{6}{16}$
2. $\frac{9}{24}$ $\frac{7}{14}$ $\frac{9}{10}$ $\frac{16}{18}$ $\frac{18}{24}$ $\frac{17}{30}$ $\frac{9}{15}$ $\frac{4}{15}$
3. $\frac{5}{10}$ $\frac{6}{8}$ $\frac{8}{12}$ $\frac{9}{15}$ $\frac{12}{18}$ $\frac{4}{6}$ $\frac{6}{9}$ $\frac{4}{12}$
4. $\frac{8}{16}$ $\frac{2}{4}$ $\frac{2}{8}$ $\frac{15}{24}$ $\frac{3}{12}$ $\frac{15}{25}$ $\frac{6}{10}$ $\frac{12}{16}$
5. $\frac{8}{10}$ $\frac{16}{20}$ $\frac{21}{36}$ $\frac{2}{10}$ $\frac{9}{27}$ $\frac{32}{48}$ $\frac{9}{12}$ $\frac{45}{60}$
6. $\frac{12}{18}$ $\frac{10}{12}$ $\frac{9}{24}$ $\frac{24}{36}$ $\frac{16}{28}$ $\frac{8}{10}$ $\frac{7}{35}$ $\frac{9}{18}$

Reduce the following to whole or mixed numbers:

7. $\frac{30}{5}$ $\frac{8}{3}$ $\frac{5}{2}$ $\frac{10}{4}$ $\frac{32}{8}$ $\frac{8}{5}$ $\frac{15}{8}$ $\frac{20}{6}$
8. $\frac{11}{3}$ $\frac{13}{4}$ $\frac{40}{6}$ $\frac{12}{8}$ $\frac{18}{5}$ $\frac{24}{6}$ $\frac{9}{4}$ $\frac{18}{9}$
9. $\frac{15}{4}$ $\frac{45}{9}$ $\frac{8}{2}$ $\frac{15}{10}$ $\frac{23}{8}$ $\frac{19}{3}$ $\frac{28}{8}$ $\frac{36}{4}$
10. $\frac{17}{2}$ $\frac{20}{5}$ $\frac{30}{9}$ $\frac{9}{5}$ $\frac{24}{5}$ $\frac{12}{3}$ $\frac{39}{7}$ $\frac{23}{3}$

Change the following to improper fractions:

11. $3\frac{1}{2}$ $2\frac{1}{4}$ $1\frac{1}{8}$ $4\frac{1}{6}$ $3\frac{1}{5}$ $1\frac{1}{9}$ $6\frac{1}{4}$
12. $1\frac{1}{7}$ $3\frac{2}{9}$ $2\frac{1}{3}$ $5\frac{3}{10}$ $4\frac{3}{8}$ $3\frac{2}{7}$ $2\frac{3}{4}$
13. $3\frac{5}{6}$ $2\frac{2}{5}$ $4\frac{7}{10}$ $2\frac{5}{8}$ $3\frac{8}{9}$ $2\frac{2}{3}$ $3\frac{4}{7}$
14. $3\frac{5}{9}$ $4\frac{7}{12}$ $2\frac{3}{7}$ $3\frac{3}{16}$ $4\frac{3}{5}$ $3\frac{5}{12}$ $8\frac{7}{8}$

Change the following to higher terms:

15. Change $\frac{1}{2}$, $\frac{1}{3}$, $\frac{2}{3}$ to 6ths; $\frac{1}{2}$, $\frac{1}{4}$, $\frac{3}{4}$ to 8ths.
16. Change $\frac{1}{2}$, $\frac{1}{5}$, $\frac{4}{5}$ to 10ths; $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{5}{6}$ to 12ths.
17. Change $\frac{1}{2}$, $\frac{1}{4}$, $\frac{3}{4}$, $\frac{1}{8}$, $\frac{3}{8}$, $\frac{5}{8}$, $\frac{7}{8}$ to 16ths; to 24ths.
18. Change $\frac{1}{2}$, $\frac{1}{4}$, $\frac{3}{4}$, $\frac{1}{5}$, $\frac{2}{5}$, $\frac{3}{5}$, $\frac{1}{10}$, $\frac{3}{10}$, $\frac{7}{10}$ to 20ths.

Interesting Work with Fractions

- Write by fourths to 2: $\frac{1}{4}$, $\frac{1}{2}$, etc.
- Write by eighths to 2: $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, etc.
- Begin at $\frac{1}{6}$ and write by sixths to 2.
- Write the following in order, beginning with the smallest: $\frac{1}{2}$ $\frac{3}{8}$ $\frac{5}{6}$ $\frac{1}{3}$ $\frac{1}{8}$ $\frac{3}{4}$ $\frac{2}{3}$ $\frac{7}{8}$
- Find: $\frac{3}{4} + \frac{2}{3}$ $\frac{3}{4} - \frac{2}{3}$ $\frac{3}{4} \times \frac{2}{3}$ $\frac{3}{4} \div \frac{2}{3}$
- Change to simplest form: $\frac{6}{8}$ $\frac{18}{3}$ $1\frac{1}{5}$ $4\frac{9}{12}$
- Find: $2 + \frac{1}{2}$ $2 - \frac{1}{2}$ $2 \times \frac{1}{2}$ $2 \div \frac{1}{2}$
- What is the sum of $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, and $\frac{1}{8}$?
- What fraction added to $\frac{3}{4}$ equals $1\frac{1}{4}$?
- What is the difference between $1\frac{1}{2}$ and $2\frac{1}{3}$?
- Find $\frac{1}{2} \times \frac{2}{3} \times \frac{3}{4}$.
- Write the quotients: $\frac{3}{4} \div \frac{1}{8}$ $3 \div \frac{3}{4}$
- Find: $\frac{1}{4}$ of 5 $\frac{1}{4}$ of 6 $\frac{1}{4}$ of 7 $\frac{1}{4}$ of 8
- Find the difference in inches between $\frac{2}{3}$ of a foot and $\frac{2}{3}$ of a yard.
- How do you know that $\frac{5}{7}$, $\frac{2}{3}$, and $\frac{7}{12}$ are proper fractions?
- How do you know that $\frac{3}{3}$, $\frac{9}{8}$, $\frac{9}{3}$, $\frac{7}{5}$, $\frac{5}{2}$, and $\frac{8}{4}$ are improper fractions?
- Multiply $\frac{2}{3}$ by 2; 2 by $\frac{2}{3}$.
- Divide $\frac{2}{3}$ by 2; 2 by $\frac{2}{3}$.
- Twenty-five cents is what part of 35 cents?
- Which is more: $\frac{3}{10}$ of 30 or $\frac{1}{3}$ of 30?
- Find: $\frac{2}{3}$ of $\frac{3}{4}$ $\frac{3}{4}$ of $\frac{2}{3}$ $\frac{2}{3} \times \frac{3}{4}$ $\frac{3}{4} \times \frac{2}{3}$
- How do you prove the result in $\frac{7}{8} - \frac{1}{4} = \frac{5}{8}$?

Addition of Fractions

Find the sums without using a pencil.

- | | | | | |
|---------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|
| 1. $\frac{1}{2} + \frac{1}{3}$ | $\frac{1}{2} + \frac{1}{4}$ | $\frac{1}{6} + \frac{1}{2}$ | $\frac{1}{3} + \frac{1}{6}$ | $\frac{1}{4} + \frac{1}{3}$ |
| 2. $\frac{1}{8} + \frac{1}{2}$ | $\frac{5}{6} + \frac{1}{3}$ | $\frac{1}{4} + \frac{1}{6}$ | $\frac{1}{8} + \frac{1}{4}$ | $\frac{1}{2} + \frac{3}{4}$ |
| 3. $\frac{1}{2} + \frac{5}{6}$ | $\frac{1}{8} + \frac{1}{6}$ | $\frac{1}{2} + \frac{2}{3}$ | $\frac{3}{8} + \frac{1}{4}$ | $\frac{1}{3} + \frac{3}{4}$ |
| 4. $\frac{3}{4} + \frac{1}{8}$ | $\frac{1}{4} + \frac{1}{5}$ | $\frac{1}{5} + \frac{1}{10}$ | $\frac{2}{5} + \frac{1}{2}$ | $\frac{3}{8} + \frac{5}{6}$ |
| 5. $\frac{1}{2} + \frac{1}{5}$ | $\frac{2}{3} + \frac{1}{4}$ | $\frac{1}{2} + \frac{3}{8}$ | $\frac{1}{10} + \frac{1}{2}$ | $\frac{1}{4} + \frac{5}{6}$ |
| 6. $\frac{1}{8} + \frac{1}{3}$ | $\frac{3}{5} + \frac{1}{2}$ | $\frac{5}{6} + \frac{5}{8}$ | $\frac{1}{4} + \frac{1}{10}$ | $\frac{2}{3} + \frac{3}{4}$ |
| 7. $\frac{3}{4} + \frac{2}{5}$ | $\frac{5}{8} + \frac{1}{2}$ | $\frac{7}{8} + \frac{2}{3}$ | $\frac{5}{6} + \frac{3}{4}$ | $\frac{1}{10} + \frac{2}{5}$ |
| 8. $\frac{3}{4} + \frac{5}{8}$ | $\frac{4}{5} + \frac{3}{10}$ | $\frac{5}{8} + \frac{1}{4}$ | $\frac{1}{2} + \frac{4}{5}$ | $\frac{3}{8} + \frac{2}{3}$ |
| 9. $\frac{3}{5} + \frac{1}{4}$ | $\frac{1}{6} + \frac{3}{4}$ | $\frac{7}{8} + \frac{5}{6}$ | $\frac{3}{4} + \frac{3}{8}$ | $\frac{1}{2} + \frac{7}{8}$ |
| 10. $\frac{1}{3} + \frac{4}{9}$ | $\frac{1}{4} + \frac{7}{8}$ | $\frac{3}{4} + \frac{1}{10}$ | $\frac{4}{5} + \frac{3}{4}$ | $\frac{7}{8} + \frac{3}{4}$ |
| 11. $1\frac{1}{3}$ | $1\frac{1}{2}$ | $1\frac{1}{6}$ | $1\frac{2}{3}$ | $1\frac{1}{8}$ |
| $\frac{1}{2}$ | $\frac{1}{4}$ | $\frac{1}{2}$ | $\frac{2}{3}$ | $\frac{1}{2}$ |
| 12. $1\frac{3}{8}$ | $1\frac{7}{8}$ | $2\frac{1}{3}$ | $1\frac{3}{4}$ | $1\frac{1}{5}$ |
| $\frac{3}{4}$ | $\frac{1}{3}$ | $\frac{1}{4}$ | $\frac{3}{4}$ | $\frac{3}{5}$ |
| 13. $2\frac{2}{3}$ | $1\frac{3}{4}$ | $1\frac{1}{4}$ | $2\frac{1}{3}$ | $1\frac{3}{4}$ |
| $\frac{1}{2}$ | $\frac{2}{5}$ | $\frac{5}{6}$ | $\frac{3}{8}$ | $\frac{1}{2}$ |
| 14. $1\frac{1}{3}$ | $2\frac{5}{8}$ | $1\frac{1}{2}$ | $2\frac{3}{4}$ | $2\frac{7}{8}$ |
| $\frac{3}{4}$ | $\frac{5}{8}$ | $\frac{3}{8}$ | $\frac{5}{8}$ | $\frac{1}{2}$ |
| 15. $1\frac{5}{6}$ | $2\frac{5}{8}$ | $1\frac{4}{5}$ | $2\frac{2}{3}$ | $1\frac{1}{8}$ |
| $\frac{2}{9}$ | $\frac{1}{3}$ | $\frac{1}{2}$ | $\frac{5}{9}$ | $\frac{5}{6}$ |
| 16. $2\frac{4}{5}$ | $1\frac{1}{6}$ | $2\frac{3}{5}$ | $1\frac{7}{8}$ | $2\frac{2}{3}$ |
| $\frac{4}{5}$ | $\frac{5}{8}$ | $\frac{3}{4}$ | $\frac{2}{3}$ | $\frac{3}{4}$ |

Problems Using Measures

1. The height of Mount Whitney is 14,495 ft. above sea level. Reduce this height to miles and feet.

2. How many square feet are there in a floor 12 ft. 8 in. long and 9 ft. wide?

3. At 95¢ per rod, what will it cost to fence a field 65 rd. long and 48 rd. wide?

4. A section of land equals 640 acres. At \$75 per acre, what is the value of 2 sections of land?

5. How many gallons of water will fill a tank 20 ft. by 14 ft. by 5 ft.? (1 cu. ft. = $7\frac{1}{2}$ gal.)

6. At \$1.15 per cubic yard, what is the value of the sand in a car 40 ft. long and 8 ft. wide, filled to a depth of $4\frac{1}{2}$ ft.?

7. At \$2.40 per square yard, what is the cost of a concrete walk $3\frac{1}{2}$ ft. wide and 12 yd. long?

8. How many gallons of water will be needed to fill a small tank 28 in. long and 21 in. wide to a depth of 15 in.? (231 cu. in. = 1 gal.)

9. At \$135 an acre, what is the value of a piece of land 180 rods long and 120 rods wide?

10. A field is 40 rods wide. How many rods long must it be to contain 15 acres?

11. At \$8.50 per cord, what is the value of a pile of wood which is 48 ft. long, 12 ft. wide, and 8 ft. high? (128 cu. ft. = 1 cord)

12. How many square inches are there in the top of a table 3 ft. 4 in. wide and 5 ft. 6 in. long?

13. What part of a mile is 440 yards?

Subtraction of Fractions

Find the remainders without using a pencil.

1. $\frac{1}{2} - \frac{1}{3}$	$\frac{1}{2} - \frac{1}{4}$	$\frac{1}{2} - \frac{1}{5}$	$\frac{1}{2} - \frac{1}{6}$	$\frac{1}{2} - \frac{1}{8}$
2. $\frac{2}{3} - \frac{1}{2}$	$\frac{2}{3} - \frac{1}{4}$	$\frac{1}{3} - \frac{1}{6}$	$\frac{5}{6} - \frac{2}{3}$	$\frac{1}{3} - \frac{1}{8}$
3. $\frac{2}{3} - \frac{3}{8}$	$\frac{2}{3} - \frac{5}{8}$	$\frac{7}{8} - \frac{1}{3}$	$\frac{3}{8} - \frac{1}{3}$	$\frac{1}{3} - \frac{1}{4}$
4. $\frac{3}{4} - \frac{1}{2}$	$\frac{3}{4} - \frac{1}{3}$	$\frac{1}{4} - \frac{1}{8}$	$\frac{3}{4} - \frac{2}{3}$	$\frac{1}{4} - \frac{1}{6}$
5. $\frac{5}{6} - \frac{1}{4}$	$\frac{5}{6} - \frac{3}{4}$	$\frac{3}{4} - \frac{3}{8}$	$\frac{7}{8} - \frac{3}{4}$	$\frac{3}{4} - \frac{5}{8}$
6. $\frac{1}{6} - \frac{1}{8}$	$\frac{3}{8} - \frac{1}{6}$	$\frac{5}{6} - \frac{1}{8}$	$\frac{5}{8} - \frac{1}{6}$	$\frac{7}{8} - \frac{5}{6}$
7. $\frac{1}{2} - \frac{2}{5}$	$\frac{1}{4} - \frac{1}{5}$	$\frac{4}{5} - \frac{1}{2}$	$\frac{3}{4} - \frac{3}{5}$	$\frac{4}{5} - \frac{1}{4}$
8. $\frac{1}{2} - \frac{3}{10}$	$\frac{1}{5} - \frac{1}{10}$	$\frac{1}{4} - \frac{1}{10}$	$\frac{7}{10} - \frac{1}{2}$	$\frac{9}{10} - \frac{3}{4}$
9. $\frac{1}{3} - \frac{1}{5}$	$\frac{2}{3} - \frac{2}{5}$	$\frac{4}{5} - \frac{2}{3}$	$\frac{2}{5} - \frac{1}{3}$	$\frac{1}{3} - \frac{1}{9}$
10. $\frac{9}{10} - \frac{4}{5}$	$\frac{4}{5} - \frac{3}{4}$	$\frac{3}{8} - \frac{1}{4}$	$\frac{3}{4} - \frac{1}{6}$	$\frac{7}{8} - \frac{3}{8}$
11. $1\frac{1}{2} - \frac{1}{3}$	$1\frac{1}{4} - \frac{1}{2}$	$1\frac{1}{3} - \frac{1}{2}$	$1\frac{1}{6} - \frac{1}{3}$	$1\frac{1}{8} - \frac{1}{4}$
12. $2\frac{2}{3} - \frac{1}{2}$	$2\frac{1}{2} - \frac{2}{3}$	$2\frac{1}{4} - \frac{3}{8}$	$2\frac{1}{6} - \frac{1}{8}$	$2\frac{1}{8} - \frac{1}{6}$
13. $1\frac{1}{4} - \frac{2}{3}$	$1\frac{3}{8} - \frac{7}{8}$	$1\frac{1}{5} - \frac{1}{4}$	$1\frac{1}{4} - \frac{5}{6}$	$1\frac{7}{8} - \frac{2}{3}$
14. $2\frac{1}{5} - \frac{4}{5}$	$2\frac{1}{2} - \frac{1}{6}$	$2\frac{1}{5} - \frac{1}{3}$	$2\frac{1}{4} - \frac{7}{8}$	$2\frac{2}{5} - \frac{3}{4}$
15. $1\frac{3}{4} - \frac{5}{6}$	$1\frac{1}{3} - \frac{5}{6}$	$1\frac{3}{4} - \frac{2}{3}$	$1\frac{1}{2} - \frac{2}{3}$	$1\frac{1}{4} - \frac{5}{8}$
16. $2\frac{7}{8} - \frac{1}{8}$	$2\frac{1}{6} - \frac{5}{6}$	$2\frac{1}{2} - \frac{2}{5}$	$2\frac{2}{3} - \frac{3}{4}$	$2\frac{1}{10} - \frac{1}{2}$

Problem Practice

1. Frank sold 4 chickens weighing $3\frac{3}{8}$ lb., $4\frac{1}{2}$ lb., $5\frac{1}{4}$ lb., and $4\frac{3}{4}$ lb. Find their total weight.
2. Joe caught 2 bass weighing $1\frac{3}{4}$ lb. and $2\frac{1}{2}$ lb. Find the difference in their weights.
3. Ruth bought 3 remnants of cloth that measured $1\frac{1}{2}$ yd., $2\frac{3}{4}$ yd., and $1\frac{5}{8}$ yd. The price was 36¢ per yard. Find the cost of these remnants.
4. At $9\frac{1}{2}$ ¢ per foot, what will it cost to fence a flower garden $14\frac{1}{2}$ ft. long and 11 ft. wide?
5. How many pounds of grass seed will it take to seed a plot of ground 70 ft. long and 30 ft. wide if 1 pound will seed 200 square feet?
6. What is the perimeter of a triangle with sides that measure $5\frac{1}{2}$ yd., $4\frac{1}{3}$ yd., and $6\frac{3}{4}$ yd.?
7. From a bolt of silk containing $11\frac{1}{2}$ yd., 2 pieces of $3\frac{3}{4}$ yd. and $4\frac{2}{3}$ yd. were sold. How many yards remained in the bolt?
8. Three girls weighed $76\frac{3}{4}$ lb., $85\frac{1}{2}$ lb., and $77\frac{3}{4}$ lb. What was their average weight?
9. Tom lives $2\frac{7}{8}$ mi. east of town and Will lives $3\frac{1}{2}$ mi. west. How far is it from Tom's home to Will's?
10. Ben is taking a bicycle trip of $9\frac{1}{2}$ mi. After riding $4\frac{7}{10}$ mi., how much farther does he have to go?
11. What part of a ton is 1600 pounds?
12. At a speed of 44 miles per hour, how far will an auto travel in $6\frac{3}{4}$ hours?
13. How many tons of coal will it take to fill a bin 9 ft. by 6 ft. by 4 ft.? (42 cu. ft. soft coal = 1 ton)

Adding Unlike Fractions

1. Add $3\frac{2}{3}$, $4\frac{5}{6}$, and $2\frac{3}{8}$.

To find the l.c.d., use the largest denominator, 8. Try 2×8 , or 16, and 3×8 , or 24. The l.c.d. is 24. Change $\frac{2}{3}$, $\frac{5}{6}$, $\frac{3}{8}$ to 24ths. Add the new numerators, 16, 20, and 9. Write $\frac{45}{24}$. Think $\frac{45}{24} = 1\frac{21}{24} = 1\frac{7}{8}$. Write $\frac{7}{8}$. Carry 1.

$3\frac{2}{3}$	16
$4\frac{5}{6}$	20
$2\frac{3}{8}$	9
$10\frac{7}{8}$	$4\frac{5}{24}$

2. Study the steps in each example below:

$4\frac{3}{4}$	6	$3\frac{5}{6}$	10	$6\frac{5}{12}$	10	$7\frac{2}{3}$	8
$2\frac{7}{8}$	7	$4\frac{3}{4}$	9	$3\frac{7}{8}$	21	$3\frac{3}{4}$	9
$7\frac{5}{8}$	$1\frac{3}{8}$	$8\frac{7}{12}$	$1\frac{9}{12}$	$10\frac{7}{24}$	$\frac{31}{24}$	$11\frac{5}{12}$	$1\frac{7}{12}$

Subtracting Unlike Fractions

1. Subtract $4\frac{3}{8}$ from $6\frac{1}{3}$.

You cannot take $\frac{3}{8}$ from $\frac{1}{3}$, so you add 1, or $\frac{8}{8}$ to $\frac{1}{3}$ to make $\frac{4}{3}$.

Change $\frac{4}{3}$ and $\frac{3}{8}$ to 24ths. Write 32 and 9. $\frac{32}{24} - \frac{9}{24} = \frac{23}{24}$. $6 - 1 - 4 = 1$.

$6\frac{1}{3}$	32
$4\frac{3}{8}$	9
$1\frac{23}{24}$	$\frac{23}{24}$

Study the steps in each example below:

2.	$6\frac{5}{8}$	8	$4\frac{1}{3}$	8	$6\frac{1}{2}$	15	$8\frac{7}{8}$	7
	$5\frac{3}{8}$	5	$1\frac{5}{6}$	5	$3\frac{4}{5}$	8	$4\frac{3}{4}$	6
	$1\frac{2}{8}$	$\frac{3}{8}$	$2\frac{1}{2}$	$\frac{3}{6}$	$2\frac{7}{10}$	$\frac{7}{10}$	$4\frac{1}{8}$	$\frac{1}{8}$
3.	$6\frac{11}{12}$	11	$5\frac{1}{6}$	28	$4\frac{3}{10}$	13	$7\frac{2}{3}$	10
	$4\frac{1}{4}$	3	$3\frac{3}{8}$	9	$2\frac{3}{5}$	6	$3\frac{1}{5}$	3
	$2\frac{2}{3}$	$\frac{8}{12}$	$1\frac{19}{24}$	$\frac{19}{24}$	$1\frac{7}{10}$	$\frac{7}{10}$	$4\frac{1}{15}$	$\frac{7}{15}$
4.	$6\frac{1}{2}$	15	$9\frac{7}{8}$	21	$7\frac{5}{8}$	13	$4\frac{1}{2}$	3
	$3\frac{7}{10}$	7	$2\frac{2}{3}$	16	$4\frac{3}{4}$	6	$4\frac{1}{3}$	2
	$2\frac{4}{5}$	$\frac{8}{10}$	$7\frac{5}{24}$	$\frac{5}{24}$	$2\frac{7}{8}$	$\frac{7}{8}$	$\frac{1}{6}$	$\frac{1}{6}$

Sight Problems

Write answers for the following:

1. When $\frac{2}{3}$ of a ton of coal costs \$5, what is the price of a ton of coal at the same rate?
2. When oranges sell at 36¢ a dozen, what will 8 oranges cost?
3. Mr. Wells raised 120 bu. of potatoes on $\frac{3}{4}$ of an acre of land. What was his yield per acre?
4. The sixth-grade baseball team won 8 games and lost 4 games. What part of their games did they win?
5. What is the cost of 18 apples that sell at 3 for 10 cents?
6. At an average speed of $7\frac{1}{2}$ miles per hour, how far can George ride his bicycle in 3 hours?
7. Ruth's mother bought 3 ducks that weighed $6\frac{1}{4}$ lb., $7\frac{5}{8}$ lb., and 8 lb. Find the total weight.
8. At an average speed of 180 miles an hour, how far will an airplane fly in 1 hr. 40 min.?
9. At 60¢ per pound, what is the cost of 2 pounds 8 ounces of candy?
10. Tom rode his bicycle $2\frac{1}{2}$ miles in 20 minutes. At that rate, how far would he ride in 1 hour?
11. When cheese sells at 32¢ a pound, how many ounces of cheese can you get for 20¢?
12. At a speed of 45 miles per hour, how far will a car travel in 40 minutes?
13. At $87\frac{1}{2}$ ¢ per hour, how much will a man earn in a 40-hour week?

Addition of Mixed Numbers

- | | | | | | | |
|--|---|---|--|---|---|--|
| 1. $4\frac{1}{2}$
$3\frac{1}{2}$
<u>8</u> | $5\frac{3}{4}$
$\frac{1}{4}$
<u>6</u> | $2\frac{2}{3}$
$1\frac{2}{3}$
<u>4</u> | $5\frac{5}{6}$
$\frac{1}{6}$
<u>6</u> | $4\frac{5}{8}$
$2\frac{7}{8}$
<u>6</u> | $3\frac{4}{5}$
$4\frac{2}{5}$
<u>7</u> | $6\frac{4}{9}$
$3\frac{8}{9}$
<u>9</u> |
| 2. $5\frac{3}{10}$
$\frac{7}{10}$
<u>6</u> | $6\frac{7}{12}$
$4\frac{1}{12}$
<u>10</u> | $3\frac{9}{10}$
$2\frac{3}{10}$
<u>6</u> | $6\frac{9}{16}$
$3\frac{5}{16}$
<u>9</u> | $4\frac{9}{10}$
$1\frac{9}{10}$
<u>5</u> | $5\frac{7}{24}$
$3\frac{5}{24}$
<u>8</u> | $4\frac{9}{20}$
$2\frac{3}{20}$
<u>6</u> |
| 3. $3\frac{2}{3}$
$\frac{5}{6}$
<u>4</u> | $2\frac{7}{8}$
$3\frac{5}{16}$
<u>5</u> | $4\frac{1}{2}$
$\frac{7}{12}$
<u>5</u> | $2\frac{3}{4}$
$3\frac{5}{8}$
<u>5</u> | $5\frac{2}{3}$
$4\frac{5}{12}$
<u>9</u> | $3\frac{3}{4}$
$\frac{7}{8}$
<u>4</u> | $4\frac{2}{3}$
$1\frac{1}{2}$
<u>6</u> |
| 4. $4\frac{5}{8}$
$4\frac{7}{12}$
<u>8</u> | $2\frac{1}{3}$
$3\frac{3}{4}$
<u>5</u> | $3\frac{4}{5}$
$2\frac{3}{4}$
<u>5</u> | $8\frac{4}{5}$
$1\frac{1}{2}$
<u>10</u> | $2\frac{7}{10}$
$3\frac{3}{5}$
<u>5</u> | $3\frac{2}{3}$
$4\frac{7}{8}$
<u>7</u> | $5\frac{5}{6}$
$2\frac{1}{2}$
<u>8</u> |
| 5. $3\frac{3}{8}$
$2\frac{5}{6}$
<u>5</u> | $6\frac{3}{4}$
$5\frac{5}{6}$
<u>11</u> | $1\frac{5}{8}$
$2\frac{1}{4}$
<u>3</u> | $4\frac{3}{4}$
$1\frac{9}{10}$
<u>6</u> | $4\frac{2}{3}$
$\frac{5}{6}$
<u>5</u> | $5\frac{3}{8}$
$6\frac{7}{24}$
<u>11</u> | $4\frac{2}{3}$
$1\frac{3}{5}$
<u>6</u> |
| 6. $7\frac{3}{4}$
$5\frac{1}{4}$
$8\frac{3}{4}$
<u>21</u> | $5\frac{5}{8}$
$7\frac{3}{8}$
$4\frac{7}{8}$
<u>17</u> | $8\frac{1}{6}$
$4\frac{5}{6}$
$6\frac{5}{6}$
<u>19</u> | $4\frac{3}{5}$
$9\frac{2}{5}$
$7\frac{4}{5}$
<u>21</u> | $6\frac{2}{3}$
$3\frac{2}{3}$
$5\frac{2}{3}$
<u>15</u> | $9\frac{3}{8}$
$8\frac{1}{8}$
$6\frac{5}{8}$
<u>24</u> | $3\frac{7}{10}$
$6\frac{1}{10}$
$8\frac{3}{10}$
<u>18</u> |
| 7. $3\frac{2}{3}$
$5\frac{1}{2}$
$1\frac{1}{6}$
<u>9</u> | $4\frac{3}{4}$
$7\frac{1}{2}$
$3\frac{7}{8}$
<u>15</u> | $7\frac{2}{5}$
$3\frac{1}{2}$
$4\frac{7}{10}$
<u>15</u> | $5\frac{1}{4}$
$4\frac{1}{2}$
$2\frac{3}{4}$
<u>12</u> | $3\frac{2}{3}$
$8\frac{1}{4}$
$5\frac{11}{12}$
<u>17</u> | $8\frac{3}{4}$
$2\frac{1}{3}$
$6\frac{5}{8}$
<u>17</u> | $4\frac{7}{8}$
$3\frac{3}{4}$
$1\frac{3}{16}$
<u>9</u> |
| 8. $4\frac{3}{4}$
$\frac{2}{8}$
$3\frac{1}{6}$
<u>8</u> | $2\frac{4}{5}$
$5\frac{3}{4}$
$\frac{3}{10}$
<u>8</u> | $7\frac{5}{6}$
$3\frac{2}{3}$
$1\frac{1}{4}$
<u>11</u> | $6\frac{1}{2}$
$8\frac{3}{4}$
$2\frac{9}{10}$
<u>16</u> | $4\frac{1}{3}$
$2\frac{4}{5}$
$3\frac{7}{15}$
<u>10</u> | $5\frac{4}{9}$
$6\frac{1}{3}$
$5\frac{5}{6}$
<u>17</u> | $\frac{2}{3}$
$4\frac{1}{3}$
$3\frac{3}{10}$
<u>8</u> |
| 9. $\frac{2}{3}$
$\frac{3}{8}$
$4\frac{5}{12}$
<u>4</u> | $1\frac{7}{8}$
$\frac{5}{8}$
$\frac{5}{16}$
<u>2</u> | $4\frac{1}{3}$
$3\frac{3}{4}$
$4\frac{11}{24}$
<u>12</u> | $3\frac{7}{8}$
$2\frac{1}{2}$
$7\frac{5}{6}$
<u>13</u> | $9\frac{3}{4}$
$5\frac{1}{2}$
$3\frac{2}{5}$
<u>18</u> | $7\frac{2}{3}$
$6\frac{1}{5}$
$8\frac{5}{6}$
<u>22</u> | $8\frac{1}{2}$
$\frac{1}{6}$
$3\frac{2}{3}$
<u>10</u> |

Problem Practice

For each step write A, S, M, or D. Work the problems.

1. Find the cost of $3\frac{1}{2}$ lb. of steak at 45¢ a pound and $2\frac{3}{4}$ lb. of lard at 16¢ a pound.

2. If you buy 25 lb. of sugar at $6\frac{1}{4}$ ¢ per pound, what is your change from \$5?

3. At an average speed of 50 miles per hour, how far will an auto travel in 5 hr. 15 min.?

4. How many square feet of linoleum will it take to cover a kitchen floor 11 ft. 8 in. by 8 ft. 3 in.?

5. Fred worked $4\frac{1}{2}$ hours at 35¢ an hour. How much did he earn?

6. At \$1.85 per hundredweight, what is the cost of 1500 pounds of corn meal?

7. At \$45 per 1000 feet, what is the cost of 2500 feet of lumber?

8. At \$9.25 per ton, what is the cost of 4800 pounds of coal?

9. When the freight rate is 87¢ per 100 lb., how much will it cost to ship 1750 lb. of freight?

10. Ruth bought $4\frac{1}{2}$ yd. of white ribbon and $6\frac{3}{4}$ yd. of red ribbon at 27¢ a yard. Find the cost.

11. Mrs. Hill bought 3 geese that weighed $6\frac{1}{2}$ lb., $7\frac{3}{4}$ lb., and $7\frac{5}{8}$ lb. At 29¢ a pound, what was the cost?

12. At \$3.75 per yard, what is the cost of $4\frac{3}{4}$ yards of dress material?

13. Using 40 in. of material for each towel, how many yards of toweling will I need for a dozen towels?

Subtraction of Fractions and Mixed Numbers

1. $\frac{5}{8} - \frac{1}{2}$ $\frac{5}{6} - \frac{3}{4}$ $\frac{5}{8} - \frac{1}{4}$ $\frac{3}{4} - \frac{1}{2}$ $\frac{5}{8} - \frac{1}{2}$ $\frac{3}{4} - \frac{1}{2}$ $\frac{5}{8} - \frac{1}{2}$ $\frac{1}{2} - \frac{1}{3}$
2. $\frac{2}{3} - \frac{1}{4}$ $\frac{7}{8} - \frac{5}{6}$ $\frac{2}{3} - \frac{1}{2}$ $\frac{7}{8} - \frac{3}{4}$ $\frac{1}{6} - \frac{1}{8}$ $\frac{3}{4} - \frac{3}{8}$ $\frac{5}{6} - \frac{1}{4}$ $\frac{2}{3} - \frac{3}{8}$
3. $\frac{3}{10} - \frac{1}{4}$ $\frac{5}{6} - \frac{1}{2}$ $\frac{4}{5} - \frac{2}{3}$ $\frac{3}{4} - \frac{5}{8}$ $\frac{2}{3} - \frac{1}{6}$ $\frac{7}{8} - \frac{1}{3}$ $\frac{5}{6} - \frac{3}{8}$ $\frac{7}{12} - \frac{1}{8}$
4. $\frac{7}{8} - \frac{1}{5}$ $\frac{11}{16} - \frac{3}{8}$ $\frac{7}{10} - \frac{1}{2}$ $\frac{3}{5} - \frac{1}{4}$ $\frac{2}{3} - \frac{3}{5}$ $\frac{7}{10} - \frac{3}{5}$ $\frac{9}{10} - \frac{3}{4}$ $\frac{8}{9} - \frac{2}{3}$
5. $\frac{2}{3} - \frac{1}{10}$ $\frac{4}{5} - \frac{3}{4}$ $\frac{5}{8} - \frac{1}{12}$ $\frac{9}{10} - \frac{2}{3}$ $\frac{4}{5} - \frac{3}{10}$ $\frac{1}{2} - \frac{3}{8}$ $\frac{11}{12} - \frac{3}{4}$ $\frac{3}{4} - \frac{2}{5}$
6. $7\frac{7}{8} - 2\frac{3}{8}$ $8 - 3\frac{2}{3}$ $6\frac{5}{8} - \frac{1}{2}$ $5\frac{1}{3} - 4\frac{1}{2}$ $4\frac{3}{8} - 3\frac{1}{3}$ $7\frac{2}{3} - 4\frac{1}{4}$ $8\frac{2}{3} - 5\frac{1}{8}$
7. $6\frac{4}{5} - 3\frac{1}{3}$ $4\frac{3}{8} - 2\frac{1}{6}$ $5\frac{3}{4} - 3\frac{5}{8}$ $8\frac{5}{8} - 6\frac{1}{3}$ $9\frac{1}{2} - \frac{2}{5}$ $7\frac{1}{3} - 5\frac{5}{6}$ $4\frac{5}{6} - 2\frac{2}{3}$
8. $6\frac{5}{6} - 4\frac{3}{8}$ $5\frac{2}{5} - 3\frac{1}{2}$ $6\frac{2}{3} - 2\frac{5}{6}$ $4\frac{1}{4} - \frac{5}{8}$ $8\frac{3}{5} - 4\frac{1}{4}$ $6\frac{3}{5} - 3\frac{2}{3}$ $5\frac{1}{6} - 2\frac{7}{8}$
9. $9\frac{1}{6} - 7\frac{2}{3}$ $2\frac{1}{6} - \frac{3}{4}$ $3\frac{5}{9} - 1\frac{1}{3}$ $5\frac{1}{6} - \frac{1}{2}$ $6\frac{7}{8} - 3\frac{2}{3}$ $9\frac{1}{4} - 5\frac{3}{8}$ $7\frac{1}{4} - 2\frac{5}{6}$
10. $8\frac{3}{4} - 3\frac{7}{10}$ $6\frac{3}{8} - 4\frac{3}{4}$ $9\frac{1}{4} - 6\frac{3}{5}$ $6\frac{1}{3} - 4\frac{4}{9}$ $5\frac{5}{12} - 2\frac{1}{6}$ $8\frac{5}{6} - 5\frac{1}{4}$ $6\frac{7}{10} - 3\frac{2}{5}$
11. $4\frac{3}{8} - 2\frac{1}{2}$ $5\frac{1}{4} - 4\frac{1}{6}$ $7\frac{9}{16} - 3\frac{3}{4}$ $6\frac{4}{5} - 2\frac{1}{3}$ $4\frac{3}{4} - 1\frac{1}{5}$

Problem Practice

For each step write A, S, M, or D. Work the problems.

1. A remnant of muslin that measured $3\frac{3}{4}$ yd. was sold for 75¢. What was the price per yard?
2. Mr. Bell drove his car 176 miles in $3\frac{2}{3}$ hours. What was his speed per hour?
3. Fred finds that his steps average 28 inches. How many yards do 200 of his steps equal?
4. Mary made 9 lb. of candy for the school fair. How many boxes, each holding $\frac{3}{4}$ lb., can she fill?
5. At 4 bars for 25¢, what do you pay for 1 bar of soap? for 2 dozen bars?
6. If $\frac{3}{4}$ lb. of nuts costs 27¢, what does 1 lb. cost?
7. May cut $4\frac{1}{2}$ yd. of toweling into 6 equal lengths. How many inches long did she cut each piece?
8. Using $1\frac{7}{8}$ bu. per acre, how many acres can a farmer seed with 25 bu. of wheat?
9. At $3\frac{1}{3}$ ¢ per pound, how many pounds of potatoes can be bought for 60¢?
10. Find the area of a square that is $5\frac{1}{2}$ ft. on each side. What is its perimeter?
11. At $2\frac{1}{2}$ ¢ per pound, how many pounds of cabbage can be bought for 25¢?
12. Ray rode his bicycle 12 miles in $1\frac{1}{2}$ hours. What was his speed per hour?
13. At 37¢ per pound, what is the cost of a $5\frac{1}{2}$ -lb. leg of lamb?

Multiplication of Fractions

- | | | | | |
|--|------------------------------------|------------------------------------|------------------------------------|------------------------------------|
| 1. $5 \times \frac{3}{4}$ | $4 \times \frac{2}{3}$ | $6 \times \frac{3}{5}$ | $8 \times \frac{5}{6}$ | $6 \times \frac{7}{12}$ |
| 2. $\frac{2}{3} \times 15$ | $\frac{5}{12} \times 16$ | $\frac{3}{5} \times 8$ | $\frac{5}{16} \times 24$ | $\frac{2}{3} \times 9$ |
| 3. $\frac{3}{4} \times \frac{1}{2}$ | $\frac{5}{6} \times \frac{2}{3}$ | $\frac{2}{5} \times \frac{3}{4}$ | $\frac{2}{3} \times \frac{7}{8}$ | $\frac{4}{5} \times \frac{11}{12}$ |
| 4. $1\frac{1}{2} \times 4$ | $2\frac{2}{3} \times 6$ | $2\frac{3}{4} \times 8$ | $1\frac{1}{2} \times 5$ | $3\frac{3}{8} \times 6$ |
| 5. $5 \times 1\frac{2}{3}$ | $2 \times 6\frac{1}{4}$ | $3 \times 1\frac{5}{6}$ | $4 \times 3\frac{2}{5}$ | $2 \times 3\frac{1}{2}$ |
| 6. $\frac{2}{3} \times 18$ | $\frac{3}{8} \times 32$ | $\frac{3}{4} \times 16$ | $\frac{4}{5} \times 10$ | $\frac{2}{3} \times 36$ |
| 7. $\frac{3}{4} \times 22$ | $\frac{5}{6} \times 20$ | $\frac{7}{10} \times 40$ | $\frac{5}{12} \times 60$ | $\frac{3}{7} \times 21$ |
| 8. $35 \times \frac{4}{5}$ | $42 \times \frac{5}{7}$ | $25 \times \frac{3}{4}$ | $12 \times \frac{7}{8}$ | $16 \times \frac{2}{3}$ |
| 9. $\frac{2}{3} \times 4\frac{1}{2}$ | $\frac{3}{4} \times 5\frac{1}{3}$ | $\frac{1}{3} \times 5\frac{1}{2}$ | $\frac{3}{8} \times 2\frac{1}{2}$ | $\frac{1}{3} \times 7\frac{1}{2}$ |
| 10. $\frac{4}{5} \times 3\frac{2}{3}$ | $\frac{5}{6} \times 4\frac{1}{2}$ | $\frac{7}{8} \times 4\frac{1}{6}$ | $\frac{3}{5} \times 3\frac{1}{3}$ | $\frac{2}{3} \times 2\frac{3}{4}$ |
| 11. $6\frac{1}{4} \times \frac{4}{5}$ | $3\frac{1}{3} \times \frac{3}{4}$ | $2\frac{1}{3} \times \frac{9}{10}$ | $1\frac{7}{8} \times \frac{4}{5}$ | $2\frac{5}{8} \times \frac{4}{9}$ |
| 12. $2\frac{3}{4} \times 6\frac{2}{3}$ | $1\frac{1}{3} \times 6\frac{3}{4}$ | $5\frac{1}{4} \times 2\frac{2}{3}$ | $2\frac{2}{5} \times 3\frac{1}{3}$ | $2\frac{2}{3} \times 3\frac{3}{4}$ |
| 13. $3\frac{3}{4} \times 5\frac{1}{2}$ | $2\frac{1}{6} \times 1\frac{1}{2}$ | $2\frac{1}{2} \times 3\frac{1}{2}$ | $4\frac{1}{2} \times 4\frac{1}{2}$ | $2\frac{3}{4} \times 3\frac{1}{3}$ |
| 14. $4\frac{1}{6} \times 2\frac{3}{5}$ | $3\frac{1}{4} \times 3\frac{3}{7}$ | $1\frac{2}{3} \times 1\frac{4}{5}$ | $2\frac{1}{4} \times 2\frac{2}{3}$ | $4\frac{1}{2} \times 5\frac{1}{3}$ |
| 15. $8\frac{1}{3} \times 2\frac{2}{5}$ | $5\frac{2}{5} \times 1\frac{1}{6}$ | $7\frac{1}{2} \times 4\frac{4}{5}$ | $5\frac{5}{6} \times 1\frac{2}{3}$ | $6\frac{1}{8} \times 1\frac{3}{4}$ |
| 16. $4\frac{1}{6} \times 3\frac{3}{5}$ | $3\frac{1}{4} \times 3\frac{3}{7}$ | $1\frac{2}{3} \times 1\frac{4}{5}$ | $2\frac{1}{4} \times 2\frac{2}{3}$ | $4\frac{1}{2} \times 5\frac{1}{3}$ |
| 17. $7\frac{1}{3} \times 2\frac{1}{4}$ | $3\frac{1}{5} \times 1\frac{1}{8}$ | $4\frac{2}{3} \times 2\frac{1}{7}$ | $5\frac{2}{3} \times 1\frac{1}{8}$ | $6\frac{1}{4} \times 1\frac{2}{3}$ |
| 18. $\frac{3}{4} \times \frac{8}{15}$ | $\frac{2}{3} \times \frac{15}{16}$ | $\frac{5}{6} \times \frac{4}{5}$ | $\frac{2}{3} \times \frac{5}{8}$ | $\frac{3}{4} \times \frac{4}{5}$ |
| 19. $\frac{5}{6} \times \frac{3}{16}$ | $\frac{5}{6} \times \frac{3}{8}$ | $\frac{4}{5} \times \frac{15}{16}$ | $\frac{9}{10} \times \frac{5}{6}$ | $\frac{5}{9} \times \frac{15}{16}$ |
| 20. $\frac{25}{8\frac{1}{2}}$ | $\frac{56}{4\frac{3}{4}}$ | $\frac{29}{2\frac{2}{3}}$ | $\frac{37}{18\frac{1}{4}}$ | $\frac{45}{9\frac{3}{8}}$ |
| 21. $\frac{18}{4\frac{7}{8}}$ | $\frac{26}{5\frac{2}{5}}$ | $\frac{36}{2\frac{5}{9}}$ | $\frac{72}{4\frac{5}{6}}$ | $\frac{19}{7\frac{3}{4}}$ |
| 22. $\frac{27}{6\frac{2}{3}}$ | $\frac{17}{5\frac{3}{4}}$ | $\frac{55}{10\frac{4}{5}}$ | $\frac{63}{5\frac{2}{9}}$ | $\frac{51}{4\frac{5}{6}}$ |

Division of Fractions

1. $\frac{1}{4} \div 2$ $\frac{1}{2} \div 5$ $\frac{1}{3} \div 3$ $\frac{1}{4} \div 3$ $\frac{1}{8} \div 2$
2. $\frac{3}{4} \div 3$ $\frac{3}{4} \div 2$ $\frac{2}{3} \div 4$ $\frac{3}{4} \div 4$ $\frac{1}{6} \div 2$
3. $\frac{5}{6} \div 2$ $\frac{3}{5} \div 2$ $\frac{5}{8} \div 4$ $\frac{3}{4} \div 5$ $\frac{1}{2} \div 2$
4. $\frac{7}{8} \div 2$ $\frac{7}{8} \div 3$ $\frac{7}{8} \div 4$ $\frac{7}{8} \div 5$ $\frac{7}{8} \div 6$
5. $1 \div \frac{1}{2}$ $1 \div \frac{1}{3}$ $1 \div \frac{2}{3}$ $1 \div \frac{1}{4}$ $1 \div \frac{3}{4}$
6. $2 \div \frac{1}{2}$ $3 \div \frac{1}{3}$ $2 \div \frac{2}{3}$ $3 \div \frac{1}{4}$ $4 \div \frac{3}{4}$
7. $1 \div \frac{1}{6}$ $5 \div \frac{1}{6}$ $1 \div \frac{5}{6}$ $2 \div \frac{1}{5}$ $2 \div \frac{1}{8}$
8. $3 \div \frac{3}{8}$ $4 \div \frac{5}{8}$ $3 \div \frac{3}{5}$ $6 \div \frac{2}{5}$ $8 \div \frac{7}{8}$
9. $1\frac{1}{2} \div 3$ $1\frac{2}{3} \div 4$ $2\frac{1}{2} \div 5$ $2\frac{1}{4} \div 3$ $2\frac{2}{3} \div 4$
10. $1\frac{3}{4} \div 2$ $3\frac{3}{4} \div 3$ $4\frac{1}{2} \div 2$ $3\frac{3}{5} \div 3$ $1\frac{4}{5} \div 2$
11. $3\frac{1}{8} \div 5$ $3\frac{3}{8} \div 6$ $7\frac{1}{2} \div 2$ $1\frac{5}{6} \div 4$ $2\frac{7}{8} \div 5$
12. $3 \div 1\frac{1}{2}$ $4 \div 1\frac{1}{4}$ $3 \div 1\frac{1}{3}$ $3 \div 1\frac{1}{8}$ $5 \div 2\frac{1}{4}$
13. $6 \div 2\frac{1}{2}$ $8 \div 2\frac{2}{3}$ $3 \div 2\frac{3}{4}$ $7 \div 1\frac{1}{3}$ $3 \div 4\frac{1}{2}$
14. $2 \div 1\frac{7}{8}$ $1 \div 1\frac{4}{5}$ $3 \div 4\frac{3}{8}$ $5 \div 6\frac{1}{4}$ $4 \div 3\frac{1}{2}$
15. $\frac{1}{2} \div \frac{1}{2}$ $\frac{1}{2} \div \frac{1}{4}$ $\frac{1}{2} \div \frac{1}{3}$ $\frac{1}{2} \div \frac{1}{6}$ $\frac{1}{2} \div \frac{1}{8}$
16. $\frac{3}{4} \div \frac{1}{2}$ $\frac{2}{5} \div \frac{2}{3}$ $\frac{1}{2} \div \frac{7}{8}$ $\frac{2}{3} \div \frac{5}{6}$ $\frac{3}{4} \div \frac{7}{8}$
17. $\frac{5}{6} \div \frac{3}{4}$ $\frac{2}{3} \div \frac{1}{2}$ $\frac{5}{8} \div \frac{3}{4}$ $\frac{4}{5} \div \frac{1}{2}$ $\frac{5}{8} \div \frac{5}{6}$
18. $\frac{1}{8} \div \frac{1}{2}$ $\frac{5}{6} \div \frac{1}{12}$ $\frac{2}{3} \div \frac{1}{6}$ $\frac{7}{8} \div \frac{2}{3}$ $\frac{7}{9} \div \frac{3}{4}$
19. $4\frac{1}{2} \div \frac{1}{2}$ $2\frac{3}{4} \div \frac{3}{8}$ $2\frac{5}{8} \div \frac{4}{5}$ $5\frac{1}{4} \div \frac{3}{5}$ $2\frac{7}{8} \div \frac{3}{4}$
20. $2\frac{2}{3} \div \frac{5}{6}$ $6\frac{3}{5} \div \frac{3}{8}$ $3\frac{5}{6} \div \frac{3}{4}$ $4\frac{1}{2} \div \frac{3}{4}$ $8\frac{2}{3} \div \frac{2}{3}$
21. $\frac{3}{4} \div 1\frac{1}{2}$ $\frac{7}{8} \div 2\frac{1}{3}$ $\frac{2}{3} \div 1\frac{1}{3}$ $\frac{5}{6} \div 2\frac{3}{4}$ $\frac{9}{10} \div 2\frac{1}{2}$
22. $\frac{5}{6} \div 2\frac{1}{3}$ $\frac{4}{5} \div 3\frac{1}{5}$ $\frac{7}{8} \div 2\frac{1}{2}$ $\frac{2}{3} \div 1\frac{1}{2}$ $\frac{5}{8} \div 2\frac{2}{3}$
23. $4\frac{1}{2} \div 2\frac{1}{4}$ $2\frac{1}{4} \div 4\frac{1}{2}$ $3\frac{1}{2} \div 1\frac{1}{4}$ $5\frac{1}{2} \div 1\frac{3}{5}$ $3\frac{1}{8} \div 1\frac{3}{8}$
24. $2\frac{1}{2} \div 3\frac{1}{2}$ $1\frac{7}{8} \div 1\frac{1}{5}$ $2\frac{1}{3} \div 2\frac{1}{2}$ $1\frac{3}{4} \div 2\frac{5}{8}$ $1\frac{1}{2} \div 3\frac{1}{3}$

Working with Decimals

Read the following decimals:

1. .9 .15 .09 6.7 1.04 2.37
2. .375 .401 .025 .007 3.018 1.005
3. 2.0134 1.00428 .00003 6.437025 .750

Write the following as decimals:

4. $\frac{6}{10}$ $\frac{9}{100}$ $\frac{37}{100}$ $\frac{4}{1000}$ $\frac{29}{1000}$ $\frac{375}{10000}$

Change these decimals to fractions in lowest terms:

5. .4 .5 .8 .25 .50 .75 .33 $\frac{1}{3}$
6. .05 .04 .10 .40 .15 .250 .12 $\frac{1}{2}$

Change the following to decimals:

7. $\frac{1}{4}$ $\frac{1}{5}$ $\frac{3}{4}$ $\frac{1}{2}$ $\frac{4}{5}$ $\frac{7}{10}$ $\frac{1}{8}$ $\frac{1}{3}$
8. $\frac{3}{8}$ $\frac{2}{3}$ $\frac{9}{10}$ $\frac{1}{6}$ $\frac{5}{8}$ $\frac{74}{100}$ $\frac{7}{20}$ $\frac{3}{5}$

Find the answers.

9. $1.7 + .025 + 64.5 + .875$ $46 + 2.5 + .006 + .35$
10. $7.4 - 1.068$ 6.07×4.5 $4.19 \div .25$ $.908 \times .75$
11. $54.7 \times .375$ $79 \div 3.8$ $.15 - .0786$ $.674 \div 5.3$
12. $1.2 - .998$ 3.2×2.87 $1.901 \div .007$ 3.69×80
13. $6.07 \div 1.9$ $6.58 \times .034$ $4.05 - .709$ $9.9 - .99$
14. $.046 \times .608$ $568 \div .74$ $87.4 - .85$ $6.7 \times .76$
15. $400 \times .675$ $1.75 \div 200$ $300.5 - .859$ $100 \div 2.5$

Find the answers. If your work is correct, the answers in each pair of examples will be equal in value.

16. $3\frac{3}{4}$ 3.75 17. $7\frac{1}{2}$ 7.5
 $+1\frac{7}{8}$ $+1.875$ $+2\frac{4}{5}$ $+2.8$
18. $2\frac{7}{20}$ 2.35 19. $6\frac{1}{4}$ 6.25
 $+4\frac{3}{4}$ $+4.75$ $-1\frac{3}{5}$ -1.6

Problem Practice

- At 19.3¢ per gallon, what do 7.5 gallons of gasoline cost?
- Milk weighs 8.6 lb. per gallon. How many gallons of milk are there in 1200 lb. of milk?
- The sides of a triangle measure 4.3 ft., 5.75 ft., and 6.5 ft. Find the perimeter of the triangle.
- At 17¢ per gallon, how many gallons of gasoline should you get for \$2? Find the result to the nearest tenth.
- Mr. Adams drove his car 197 miles in 4.5 hours. What was his average speed per hour?
- At \$75 per 1000 ft., what is the cost of 2250 feet of flooring?
- An auto traveled 115 miles on 7 gallons of gasoline. Find, to the nearest tenth, the number of miles traveled per gallon.
- What is the average speed of an airplane that travels a distance of 947 miles in 4.5 hours?
- How many bushels of rye can be put in a bin 18 ft. by 7.5 ft. by 4 ft.? (1 bu. rye = 1.25 cu. ft.)
- When 10 gallons of gasoline cost \$1.87, what is the price per gallon?
- A fast train traveled 982 miles in 17 hours. Find the average rate per hour, to the nearest hundredth.
- How many gallons of water will it take to fill a tank 12 ft. long and 8 ft. wide, to a depth of 4.5 ft. (1 cu. ft. water = $7\frac{1}{2}$ gal.)
- What decimal part of an hour is 36 min.? 45 min.?

Help in Division of Decimals

Study the following examples:

- $$\begin{array}{r} 1.62 \\ 5 \overline{)8.10} \end{array}$$

$$\begin{array}{r} .375 \\ 4 \overline{)1.500} \end{array}$$

$$\begin{array}{r} .06 \\ 6 \overline{).36} \end{array}$$

$$\begin{array}{r} 6.9 \\ 7 \overline{)48.3} \end{array}$$

$$\begin{array}{r} .375 \\ 8 \overline{)3.000} \end{array}$$
- $$\begin{array}{r} 14 \\ .4 \overline{)5.6} \end{array}$$

$$\begin{array}{r} 80 \\ .08 \overline{)6.40} \end{array}$$

$$\begin{array}{r} 300 \\ .006 \overline{)1.800} \end{array}$$

$$\begin{array}{r} .7 \\ .07 \overline{).049} \end{array}$$
- $$\begin{array}{r} .08 \\ .3 \overline{).024} \end{array}$$

$$\begin{array}{r} 2.2 \\ .05 \overline{).110} \end{array}$$

$$\begin{array}{r} 25.5 \\ .008 \overline{).2040} \end{array}$$

$$\begin{array}{r} 70.2 \\ .9 \overline{)631.8} \end{array}$$
- $$\begin{array}{r} 250 \\ .025 \overline{)6.250} \\ \underline{50} \\ 125 \\ \underline{125} \\ 0 \end{array}$$

$$\begin{array}{r} .25 \\ .25 \overline{).0625} \\ \underline{50} \\ 125 \\ \underline{125} \end{array}$$

$$\begin{array}{r} .25 \\ 2.5 \overline{).625} \\ \underline{50} \\ 125 \\ \underline{125} \end{array}$$

$$\begin{array}{r} 2.5 \\ .25 \overline{).625} \\ \underline{50} \\ 125 \\ \underline{125} \end{array}$$
- $$\begin{array}{r} .875 \\ 8 \overline{)7.000} \end{array}$$

$$\begin{array}{r} .183 \\ 6 \overline{)1.100} \end{array}$$

$$\begin{array}{r} .029 \\ 7 \overline{).200} \end{array}$$

$$\begin{array}{r} .667 \\ 9 \overline{)6.000} \end{array}$$
- $$\begin{array}{r} .556 \\ .9 \overline{).5000} \end{array}$$

$$\begin{array}{r} .495 \\ 5 \overline{)2.473} \end{array}$$

$$\begin{array}{r} 23.333 \\ .03 \overline{).70000} \end{array}$$

$$\begin{array}{r} .167 \\ 6 \overline{)1.000} \end{array}$$
- $$\begin{array}{r} .395 \\ 43 \overline{)17.000} \\ \underline{129} \\ 410 \\ \underline{387} \\ 230 \\ \underline{215} \\ 15 \end{array}$$

$$\begin{array}{r} .047 \\ 9.6 \overline{).4500} \\ \underline{384} \\ 660 \\ \underline{576} \\ 84 \end{array}$$

$$\begin{array}{r} 8.042 \\ .59 \overline{)4.74500} \\ \underline{472} \\ 250 \\ \underline{236} \\ 140 \\ \underline{118} \\ 22 \end{array}$$

$$\begin{array}{r} 2.17 \\ 9.2 \overline{)20.000} \\ \underline{184} \\ 160 \\ \underline{92} \\ 680 \\ \underline{644} \\ 36 \end{array}$$

Problem Practice

For each step write A, S, M, or D. Work the problems.

1. A cubic foot of water weighs $62\frac{1}{2}$ lb. If a tank 24 ft. long and 16 ft. wide is filled to a depth of 4 ft., what is the weight of the water?

2. Joe weighed $89\frac{3}{4}$ lb. last May, and now he weighs $94\frac{1}{2}$ lb. How many pounds has he gained?

3. Mr. Wells bought an auto. He traded in his old car for \$325 and paid the balance in 12 monthly payments of \$51.34 each. How much did the auto cost him?

4. When cheese sells at 36¢ a pound, what would you have to pay for $\frac{3}{4}$ pound?

5. If a car runs 17.5 miles on a gallon of gasoline, how far will it go on 100 gallons?

6. How many 1-inch cubes will it take to make a pile 5 in. long, 4 in. wide, and 3 in. high?

7. Milk weighs 8.6 lb. per gallon. What is the weight of 100 gallons of milk?

8. At the rate of $87\frac{1}{2}$ ¢ an hour, how much will a man earn in 8 hours?

9. Using $1\frac{3}{4}$ bu. of seed wheat per acre, how many bushels do I need to seed a field of $19\frac{1}{2}$ acres?

10. What fraction of a mile is 220 yards? 880 yards? 660 yards?

11. At 30¢ per square foot, what will it cost to lay a hardwood floor in a room 42 ft. by 24 ft.?

12. A truck load of wheat weighed 7854 lb. The empty truck weighed 3269 lb. At 96¢ per bushel, what was the value of the wheat?

Division of Decimals

Divide, to the nearest thousandth when necessary.

1. $4\overline{)3.6}$ $5\overline{)7.5}$ $6\overline{)0.054}$ $7\overline{)30.8}$ $3\overline{)0.009}$
2. $.5\overline{)16}$ $.05\overline{)73}$ $.006\overline{)12}$ $.8\overline{)160}$ $.9\overline{)4}$
3. $.2\overline{)2.6}$ $.7\overline{)49}$ $.02\overline{)1}$ $.5\overline{)0.008}$ $.006\overline{)2.04}$
4. $.6\overline{)93.6}$ $.4\overline{)0.125}$ $.09\overline{)3.1}$ $.7\overline{)0.035}$ $.004\overline{)10.2}$
5. $10\overline{)68}$ $.1\overline{)4.5}$ $100\overline{)36}$ $.01\overline{)7.5}$ $.001\overline{)75}$
6. $10\overline{)0.03}$ $100\overline{)6.4}$ $1000\overline{)75}$ $.001\overline{)25}$ $1000\overline{)84}$
7. $.11\overline{)4.4}$ $7.5\overline{)1.5}$ $.16\overline{)8}$ $.15\overline{)1.35}$ $12.5\overline{)18}$
8. $6.3\overline{)7.09}$ $.48\overline{)6.6}$ $.14\overline{)3.07}$ $5.2\overline{)161}$ $6.25\overline{)90}$
9. $.53\overline{)43.7}$ $7.7\overline{)329}$ $.026\overline{)13}$ $4.9\overline{)3.54}$ $6.4\overline{)519}$
10. $34\overline{)238.6}$ $2.2\overline{)3.41}$ $.19\overline{)8.17}$ $.043\overline{)7.2}$ $.75\overline{)0.12}$
11. $4\overline{)15}$ $6\overline{)98}$ $25\overline{)18}$ $40\overline{)25}$ $96\overline{)12}$ $180\overline{)45}$
12. $72\overline{)31}$ $75\overline{)30}$ $64\overline{)12}$ $94\overline{)45}$ $50\overline{)17}$ $48\overline{)60}$
13. $24\overline{)40}$ $11\overline{)7}$ $13\overline{)8}$ $44\overline{)18}$ $60\overline{)58}$ $27\overline{)45}$
14. $25\overline{)14}$ $19\overline{)11}$ $65\overline{)13}$ $49\overline{)15}$ $16\overline{)95}$ $72\overline{)48}$

Change the following fractions to decimals:

15. $\frac{2}{3}$ $\frac{7}{8}$ $\frac{5}{6}$ $\frac{4}{5}$ $\frac{7}{12}$ $\frac{13}{20}$ $\frac{5}{24}$ $\frac{17}{25}$
16. $\frac{11}{16}$ $\frac{19}{40}$ $\frac{12}{35}$ $\frac{17}{24}$ $\frac{29}{60}$ $\frac{9}{20}$ $\frac{5}{8}$ $\frac{19}{30}$
17. $\frac{5}{9}$ $\frac{4}{7}$ $\frac{11}{12}$ $\frac{15}{16}$ $\frac{39}{30}$ $\frac{9}{16}$ $\frac{8}{15}$ $\frac{5}{8}$
18. $\frac{19}{20}$ $\frac{13}{25}$ $\frac{47}{50}$ $\frac{25}{9}$ $\frac{7}{16}$ $\frac{5}{12}$ $\frac{25}{48}$ $\frac{48}{40}$
19. $\frac{6}{7}$ $\frac{8}{11}$ $\frac{2}{9}$ $\frac{1}{12}$ $\frac{3}{8}$ $\frac{9}{10}$ $\frac{1}{15}$ $\frac{7}{25}$

Sight Problems

1. A chair that sold regularly for \$35 was placed on sale at a reduction of 20%. Find the sale price.
2. Robert took a test of 20 problems and received a grade of 95%. How many of his answers were right?
3. In a test Fred spelled correctly 18 words out of 24. What per cent of the words did he spell correctly?
4. A soap that sold last year at 4¢ a bar is now selling at 5¢. What per cent has the price increased?
5. In a series of games, a baseball team won 6 games and lost 2. What per cent did the team win?
6. In a month of 30 days, 12 days were rainy. What part of the days were rainy? What per cent?
7. In selling subscriptions to a magazine, Ruth gets 15% of her sales. How much does she get from sales totaling \$20?
8. At \$1.33 $\frac{1}{3}$ per yard, what do 12 yd. of cloth cost?
9. Frank solved 85% of 20 problems correctly. How many problems did he solve correctly?
10. A \$10 chair has been put on sale at 25% off. How much can be saved by buying 6 of these chairs?
11. A \$2 knife was put on sale at \$1.50. What per cent was the price reduced?
12. Twenty-seven inches is what per cent of 1 yard?
13. Mr. Hill sold his house for \$8000 through an agent. At 5%, what was the agent's commission?
14. A suit was sold for \$16, a reduction of 33 $\frac{1}{3}$ % from the regular price. What was the regular price?

Fractions and Per Cents

Change these per cents to decimals, then to fractions:

1. 10% 5% 8 $\frac{1}{3}$ % 4% 12 $\frac{1}{2}$ % 15% 16 $\frac{2}{3}$ %
2. 25% 30% 33 $\frac{1}{3}$ % 37 $\frac{1}{2}$ % 40% 45% 50%
3. 60% 65% 66 $\frac{2}{3}$ % 70% 75% 80% 87 $\frac{1}{2}$ %

Change these fractions to decimals, then to per cents:

4. $\frac{1}{5}$ $\frac{1}{3}$ $\frac{1}{8}$ $\frac{1}{4}$ $\frac{1}{6}$ $\frac{1}{2}$ $\frac{1}{10}$ $\frac{1}{12}$
5. $\frac{2}{3}$ $\frac{3}{4}$ $\frac{5}{6}$ $\frac{3}{10}$ $\frac{5}{8}$ $\frac{4}{5}$ $\frac{7}{10}$ $\frac{1}{20}$
6. $\frac{1}{25}$ $\frac{1}{40}$ $\frac{7}{20}$ $\frac{8}{25}$ $\frac{9}{10}$ $\frac{7}{40}$ $\frac{3}{5}$ $\frac{7}{8}$

Change the following decimals to per cents:

7. .6 .8 .45 .5 1.5 1.25 2.5
8. 4.1 .02 .1 .05 .015 .045 .255
9. .84 .402 .0625 .461 .98 .125 .875
10. .750 .068 .905 .005 .084 .07 .90
11. 2.5 3.25 4.75 2.4 3.2 1.8 1.04

Change the following to decimals or to whole numbers:

12. 150% 200% 375% 35.6% 400% 750%
13. 56.2% 7.25% 1.5% 2.4% .125% 2.1%
14. .086% .105% .40% 105% 110% 180%
15. 10 $\frac{1}{2}$ % 6 $\frac{1}{4}$ % 112 $\frac{1}{2}$ % 7 $\frac{1}{8}$ % 103 $\frac{1}{4}$ % 108.9%

Change the numbers below to per cents:

16. 1 $\frac{3}{4}$ 1 $\frac{1}{2}$ 1 $\frac{1}{8}$ 1 $\frac{1}{4}$ 1 $\frac{1}{5}$ 1 $\frac{1}{3}$ 1 $\frac{2}{3}$
17. 2 $\frac{1}{2}$ 1 $\frac{1}{6}$ 1 $\frac{3}{8}$ 1 $\frac{4}{5}$ 1 $\frac{1}{10}$ 2 $\frac{2}{3}$ 1 $\frac{7}{8}$
18. 2 $\frac{5}{8}$ 2 $\frac{3}{5}$ 1 $\frac{5}{8}$ 1 $\frac{5}{6}$ 1 $\frac{2}{5}$ 2 $\frac{1}{8}$ 1 $\frac{3}{10}$
19. $\frac{1}{50}$ $\frac{23}{25}$ $\frac{1}{9}$ $\frac{1}{11}$ $\frac{5}{12}$ $\frac{31}{50}$ $\frac{1}{7}$

Problem Practice

1. An agent sold a farm for \$9600. After paying a commission of 5%, how much did the owner have left?
2. What will an overcoat cost that is marked \$15 and sold at a discount of 15%?
3. If a man earns \$300 a month and saves $12\frac{1}{2}\%$ of it, how much does he save in 1 year?
4. Henry earned \$25 and saved \$6 of it. What per cent of his earnings did he save?
5. A real estate agent sold 240 acres of land at \$125 an acre. At 5%, what was the amount of his commission? How much did the owner get?
6. A school nurse found that 15% of 480 children in a school were underweight. How many children were underweight?
7. Mrs. Hall got 5% off on her gas bill of \$3.86 by paying it within 10 days. What was the reduction?
8. During a storm, 14 pupils were absent out of a class of 35. What per cent of the pupils were absent?
9. A dealer sold 45 automobiles last summer at \$840 each. His commission was 20% of the selling price. How much did he make on these sales?
10. Nancy has saved 75¢ toward buying a \$3 sweater. What part of the price has she saved? what per cent?
11. A \$40 overcoat was put on sale at 30% off the usual price. What was the sale price?
12. Mr. Hall's income is \$2400 a year. He spends 20% for rent, 20% for food, 15% for clothes, 35% for other items, and saves the rest. How much does he save?

Practice in Percentage

Change per cents to fractions.

- | | | |
|----------------------------|-------------------------|-------------------------|
| 1. 25% of 4 | 25% of 10 | 50% of 12 |
| 2. 50% of 13 | 10% of 20 | 10% of 25 |
| 3. 75% of 12 | $33\frac{1}{3}\%$ of 12 | 40% of 50 |
| 4. 80% of 45 | $16\frac{2}{3}\%$ of 24 | $12\frac{1}{2}\%$ of 48 |
| 5. $37\frac{1}{2}\%$ of 64 | 5% of 80 | $8\frac{1}{3}\%$ of 36 |
| 6. 4% of 50 | 75% of 44 | 150% of 12 |
| 7. 2% of 250 | 25% of 25 | $62\frac{1}{2}\%$ of 32 |
| 8. 60% of 35 | 90% of 70 | 150% of 8 |
| 9. 20% of 30 | 40% of 150 | $66\frac{2}{3}\%$ of 15 |

Find the following per cents of these amounts:

- | | | |
|--------------------------------|-------------|-------------------------|
| 10. 6% of \$720 | 17% of 150 | 42% of 225 |
| 11. 55% of \$9.50 | 52% of 87 | $5\frac{1}{2}\%$ of 75 |
| 12. 27% of \$480 | 8.4% of 120 | 10% of 145 |
| 13. 46% of \$570 | 26% of 670 | 3% of 1500 |
| 14. $12\frac{1}{2}\%$ of \$250 | 18% of 400 | $8\frac{1}{2}\%$ of 400 |
| 15. $6\frac{1}{4}\%$ of \$64 | 150% of 90 | 12% of 370 |

In each pair of numbers below, what per cent is the first number of the second?

- | | | | |
|---------------|------------|----------|-----------|
| 16. 6 24 | 3 12 | 4 20 | 5 30 |
| 17. 4 40 | 4 12 | 8 12 | 9 12 |
| 18. 6 12 | 18 24 | 8 24 | 8 48 |
| 19. 25 40 | 9 15 | 5 8 | 7 21 |
| 20. 12 60 | 24 80 | 9 72 | 67 100 |
| 21. 80 200 | 400 500 | 13 65 | 18 27 |

Problem Practice

1. Ruth has 3 pieces of lace that measure 3 yd. 8 in., 1 yd. 18 in., and 2 yd. 20 in. How many yards are there in these pieces?
2. What is the difference in weight between 2 turkeys, one weighing 14 lb. 12 oz. and the other 15 lb. 8 oz.?
3. What is the perimeter of a room 10 ft. 9 in. wide and 14 ft. 7 in. long?
4. Fred cut a board 7 ft. 8 in. into 4 equal lengths. Find the length of each piece in feet and inches.
5. Find the interest on \$320 for 1 yr. 6 mo. at 6%.
6. Sugar that sold at 5¢ per pound last year is now selling at 6¢ per pound. What per cent has the price of sugar been increased?
7. At 17.6¢ per gallon, what do 10 gal. of gas cost?
8. A \$25 overcoat was put on sale for \$20. What per cent was the price reduced?
9. A chair that sold for \$5 has been reduced 25%. What is the sale price of the chair?
10. May had \$4.58 on hand on March 1. During the month she received \$7.09 and paid out \$6.95. What was her balance at the end of March?
11. How many square feet are there in a triangle with a base of 40 feet and a height of 25 feet?
12. When \$6 shoes are placed on sale at a reduction of 15%, how much can be saved by buying 3 pairs?
13. When a family with an income of \$200 per month spends \$40 for food, what per cent of the income is used to buy food?

This is the last page.